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ABSTRACT

The report has described the results of a questionnaire survey covering task performance in the occupational area of hospital engineering and maintenance and the implications for curriculum development in personnel training. Survey respondents were selected from among personnel of 48 health care facilities in six cities, representing various sized hospitals and extended care facilities. The questionnaire consisted of a task list of 386 possible tasks that might be performed in hospital maintenance departments and was tested in a presurvey among maintenance department personnel at hospitals in the Los Angeles area. The national survey indicated that differentiations of tasks performed by maintenance personnel can be made among occupational titles and categories. A clear division of labor existed between maintenance superintendents and maintenance workers, even in small facilities with few workers. Classification of personnel not administrative or craft specializing fell into three categories: mechanical, building, and general maintenance. Curricula for superintendents need to be management related and to include knowledge and skills necessary for task supervision. All maintenance workers need training in a common core of tasks with additional training to qualify in one of the three maintenance categories. (EA)

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# THE UCLA ALLIED HEALTH PROFESSIONS PROJECT

## ENGINEERING MAINTENANCE

### Occupational Analysis

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# OCCUPATIONAL ANALYSIS

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## FOREWORD

The Division of Vocational Education, University of California, is an administrative unit of the University which is concerned with responsibilities for research, teacher education, and public service in the broad area of vocational and technical education. During 1968 the Division entered into an agreement with the U.S. Office of Education to prepare curricula and instructional materials for a variety of allied health occupations. For the most part, such materials are related to pre-service and in-service instruction for programs ranging from on-the-job training through the Associate degree level.

A National Advisory Committee, drawn from government, education, professional associations in the health care field, and the lay public, provides guidance and help to the over-all activities of the Allied Health Professions Projects. The following individuals and institutions participate in the activities of this nationwide interdisciplinary body:

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This report is a summary of the functional analysis of occupational groups within the area of hospital engineering maintenance. The analysis is based upon a survey made to identify performance of tasks by maintenance personnel in health care facilities throughout the nation.

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## SUMMARY

### Objectives

1. To analyze and describe the performance of tasks by personnel within hospital maintenance departments.

2. To determine the implications of task analysis for the construction of curricula to train personnel for employment in hospital maintenance departments.

### Procedures

1. An inventory of tasks that could be performed by hospital maintenance personnel was compiled from a search of pertinent literature.

2. Data on performance of tasks listed in the inventory were collected by a survey of personnel employed in the maintenance departments of a national sample of health care facilities.

3. Responses to the survey by five groups of respondents were analyzed.

### Findings

1. Differentiations with respect to the tasks performed by maintenance personnel can be made among occupational titles and among empirically defined categories within occupational titles.

2. The tasks performed by maintenance superintendents are principally, and in many cases almost exclusively, managerial. Maintenance workers perform various tasks cutting across the lines of different crafts and trades, and few of them participate at all in management of maintenance operations.

3. Three categories of maintenance workers can be functionally defined in terms of patterns of task performance. The characteristics that differentiate these categories are indicated by their designations as mechanical maintenance workers, building maintenance workers, and general maintenance workers.

### Conclusions

1. Curricula can be designed to provide training for different categories of personnel in accordance with the actual requirements of positions that exist in hospital maintenance departments.

2. Curricula for maintenance superintendents should provide training principally in maintenance management, and should include teaching

of the skills and knowledge necessary for exercising supervision over tasks that are performed by maintenance workers.

3. Curricula for maintenance workers should cover the tasks shown by the survey to be performed by each category of workers. These curricula can be organized into sequences that will provide a progression from qualification as either a mechanical worker or a building maintenance worker to qualification as a general maintenance worker.

# I. INTRODUCTION

Early in 1968 the U.S. Office of Education invited proposals for research and development programs to stimulate the recruitment and training of manpower for the allied health occupations. A proposal submitted by the Division of Vocational Education, University of California at Los Angeles was approved, and a program designated as the Allied Health Professions Projects (AHPP) was funded for a four-year period. The objectives of the program are to develop curricula and educational materials for allied health occupations at levels ranging from pre-service and in-service training programs to junior college Associate degree programs, and to provide means for disseminating these materials, evaluating their effectiveness, and updating them to conform with occupational changes.

The initial steps leading to the development of curricula for each selected occupation involve identification and listing of all possible tasks in a specified functional area, and verification of their appropriateness to the occupational category under consideration. Verification of the tasks may be accomplished by a survey of personnel currently employed in the occupation at health care facilities to determine which tasks are being performed. Hospital Engineering and Maintenance is one of the occupational areas under consideration for curriculum development, and the present report describes the results of a survey of task performance in this field.

The responsibilities of a hospital maintenance department extend over many different areas of activity, embracing operation and maintenance of buildings and a great variety of machinery and equipment. Carpentry, plumbing, steam fitting, and other occupations may be represented by specialized craftsmen among the department's personnel. Occupations such as hospital electrician, hospital plumber, hospital carpenter, etc., however, do not really exist as work categories that are distinguishable from those of electrician, plumber, carpenter, etc., and it is not the intention of the AHPP to attempt development of curricula for occupations such as these. Differences may exist between what a craftsman does in a hospital and what he does in industrial or other settings, but the appropriate training for him would still be designed to meet general standards established for the craft. General maintenance work, on the other hand, is not well-defined, and therefore selective training oriented toward the needs of a particular class of institutions could be appropriate. For these reasons, the present study was directed toward occupational analysis of hospital maintenance functions performed by personnel who are concerned with general maintenance, either as workers or as supervisors, and who do not specialize in only one craft.

## II. PROCEDURE

### A. Development of the Task List

A list of possible tasks that might be performed in hospital maintenance departments was compiled from job descriptions and surveys of literature on hospital and industrial maintenance. The principal sources consulted are indicated in Appendix I. The task list covered maintenance management, safety, power plant operation, plumbing, electrical systems, motors and machinery, refrigeration and air-conditioning, elevators; and various aspects of building maintenance, including carpentry, masonry, and painting.

The task list, in the form of a questionnaire, was tested in a pre-survey conducted among maintenance department personnel at hospitals in the Los Angeles area. Responses were obtained from five engineers and seven maintenance workers. Analysis of the pre-survey results, with particular attention to write-ins and comments by respondents, indicated that expansion of the task list would be necessary in some areas to cover functions that had not been adequately represented, whereas in other areas certain kinds of functions seemed to have been given a coverage disproportionate to their probabilities of performance by maintenance personnel. One of the problems encountered in developing a final task list was that of providing adequate coverage of the great variety of maintenance operations that can be performed in a hospital without making the list so long as to discourage respondents from completing the questionnaire. Wherever possible, therefore, any tasks that represented components whose performance could be considered implied in the performance of a more broadly defined function were eliminated as separate tasks and incorporated in a single more inclusive task description. Revision of the task list in this manner resulted in substantial reductions in the numbers of tasks dealing with elevator maintenance, concrete and masonry construction work, roofing, wooden flooring, radiators, and the installation of refrigeration machinery.

The final list employed in the national survey consisted of 386 tasks. To facilitate analysis and presentation of the survey results, the list has been subdivided into the following fifteen functional areas:

Maintenance management (60 tasks)
General maintenance (16 tasks)
Power plant operations (26 tasks)
Power plant maintenance (21 tasks)
Plumbing installation and metal work (15 tasks)
Plumbing maintenance (37 tasks)
Electrical installation and testing (26 tasks)
Electrical systems and machinery maintenance (26 tasks)
Refrigeration and air-conditioning (28 tasks)
Elevator maintenance (12 tasks)
Carpentry (34 tasks)
Flooring and siding installation and maintenance (13 tasks)
Masonry, roofing, and grounds maintenance (19 tasks)
Painting and plastering (29 tasks)
Safety and fire protection (24 tasks)

## B. Design and Objectives of the Survey Instrument

The survey instrument was a questionnaire designed to obtain data on dimensions of performance thought to be relevant to the development of curricula. Responses were elicited to the following questions about each task:

1. Do you perform the task?
2. Do you supervise performance of the task by others?
3. How often do you perform the task?
4. How difficult is the task?

Respondents were instructed to answer the first two questions for each task, and to answer the third and fourth questions only if they performed the task. The questionnaire was accompanied by a short Background Information Sheet which asked questions concerning the respondent's status, experience, and education. The instructions given to respondents for self-administration of the questionnaire, the Background Information Sheet, and the first page of the survey questionnaire are shown in Appendix II. The complete list of tasks included in the questionnaire is contained in tables that accompany the text.

From the standpoint of curriculum construction, the most important information that responses to this questionnaire can provide about a task is simply whether or not it is performed by personnel in the category under consideration. It can be presumed that performance of a task by substantial proportions of one or more categories of personnel would constitute a prima facie case for inclusion of the task in any curriculum intended for the instruction of such personnel. Supervision of a task performed by others also may provide grounds for inclusion of the task in a curriculum, if effective supervision requires knowledge and skills equivalent to these needed for performance, but this determination usually would require consideration of aspects of the task other than those with which the present survey is concerned. Information on frequencies and difficulties of performance may have some utility in determining priorities and relative degrees of emphasis given to tasks in a curriculum, but here again other considerations would properly enter into these determinations. The results of a survey such as this one do not constitute a complete prescriptive guide to the design of curricula; they are meant to serve only as a means of assisting, not of replacing, the critical judgments required for curriculum development.

C. The Survey Sample

The survey respondents were selected from among personnel employed in 48 health care facilities in six metropolitan areas: Birmingham, Boston, Chicago, Denver, Los Angeles, and Seattle. Two large hospitals (200 or more beds), two medium-sized hospitals (100 to 199 beds), two small hospitals (fewer than 100 beds), and two extended-care facilities within a 200-mile radius of each city had previously been selected to comprise the national sample for this and other surveys conducted by the Allied Health Professions Projects. Selections within the metropolitian areas first were made randomly from among facilities accredited by the Joint Commission on Accreditation and approved by Medicare. Local Hospital Associations then were contacted and substitutions were made for any of the initially chosen facilities that were known to be uncooperative toward survey projects. Other substitutions were made on later occasions for facilities that withdrew from the project. The composition of the facility sample at the time the present survey was made is shown in Appendix III.

Selection of respondents within each facility was guided by information that had been obtained about the numbers and kinds of maintenance personnel employed in the facilities comprising the sample. Many of the small hospitals and extended-care facilities had very small maintenance departments, often with no more than two or three members. Consequently an attempt was not made to obtain equal proportions of respondents from smaller and larger facilities. At most of the small hospitals and extended-care facilities, all personnel in the maintenance departments were selected as respondents; at the medium and large hospitals from four to six persons in each department were selected. The survey questionnaires were sent to a member of the staff of each facility, who had previously agreed to assist in administration of the survey, and he was asked to distribute the questionnaires to a specified number of maintenance department personnel, designated by their position titles whenever these were known. When information about the staffing of a facility was lacking, a request was made for distribution of questionnaires to the department head or superintendent of maintenance and to a specified number of "general maintenance workers."

A total of 200 questionnaires was distributed to 48 facilities, and 130 were returned from 31 facilities. The rate of return, in terms of both individual respondents and facilities, was 65 percent. Responses by facility size and by geographic area are shown in Tables 1 and 2, respectively. The low rates of return from small hospitals and extended-care facilities, together with the relatively limited numbers of personnel available as respondents at each, resulted in their being represented by a rather small proportion of the total sample. The low percentage of returns, however, was partly due to the distribution of more questionnaires than necessary to some of the facilities; i.e., the number of questionnaires exceeded the number of potential respondents. Two of the extended-care facilities to which questionnaires were sent replied that they had no maintenance personnel, and there may have been others like these among the facilities that did not respond to the survey. Some geographical imbalance was produced in the sample by the larger numbers of responses from Boston and Denver, which reflected the higher rates of return from large and medium-sized hospitals in these two areas.

TABLE 1

SURVEY DISTRIBUTION AND RESPONSE BY
FACILITY SIZE AND TYPE

| Facility | Number Distributed | Number Returned | Percent Returned | Percent of Facilities Responding |
|---|---|---|---|---|
| Large Hospitals | 68 | 52 | 76 | 75 |
| Medium-Sized Hospitals | 62 | 49 | 79 | 75 |
| Small Hospitals | 42 | 16 | 38 | 50 |
| Extended-Care Facilities | 28 | 13 | 46 | 58* |
| Total | 200 | 130 | 65 | 65* |

TABLE 2

SURVEY DISTRIBUTION AND RESPONSE BY
GEOGRAPHIC AREA

| Area | Number Distributed | Number Returned | Percent Returned | Percent of Facilities Responding |
|---|---|---|---|---|
| Birmingham | 33 | 19 | 56 | 62 |
| Boston | 38 | 29 | 76 | 75 |
| Chicago | 29 | 15 | 52 | 62 |
| Denver | 39 | 29 | 74 | 75 |
| Los Angeles | 30 | 18 | 60 | 75* |
| Seattle | 31 | 20 | 64 | 62* |

*Includes an extended-care facility that returned no questionnaire but responded stating that it had no maintenance department.

## 2. Data Analysis

The survey questionnaire provided four responses to each task: whether or not the respondent performed it, whether or not he supervised its performance by others, the frequency with which the respondent performed the task, and the difficulty of the task as perceived by the respondent. Performance and supervision responses were scored as either positive or negative. Frequency and difficulty responses were assigned numerical values as follows:

Frequency of performance

1. Several times a day
2. Once a day or several times a week
3. Once a week or several times a month
4. Once a month or less

Difficulty of performance

1. Easy
2. Moderate
3. Difficult

Assistance in the reduction and computer analysis of the survey data was provided by the Survey Research Center of the University of California, Los Angeles. The survey responses first were analyzed to determine if there was any basis for partitioning the sample into respondent groups that would be functionally differentiated in terms of patterns of task performance. For all possible pairs of respondents, the ratio of the number of tasks performed by both members of the pair to the total number performed by either was calculated. This ratio served as an index of similarity between patterns of task performance by individual respondents, ranging from zero between respondents performing completely different sets of tasks to unity between respondents performing exactly the same set of tasks.

Five principal clusters were found by examination of the matrix of similarity indices among all respondents. Each cluster consisted of a respondent group whose members had similarity indices among themselves that were high relative to their similarity indices with other respondents. Initially these five clusters accounted for about half the sample. The other respondents then were assigned to whichever cluster they best fitted until the clusters had been expanded as far as was possible without destroying their homogeneities and the differentiations among them. In this way 115 of the respondents were classified into five relatively homogeneous groups, leaving 15 respondents with idiosyncratic patterns of task performance who did not fit into any group and who therefore were omitted from further analyses of the survey responses.

The numbers and percentages within each respondent group who performed and supervised each task were determined, and means and frequency distributions were obtained for the frequency and difficulty scores of each respondent group. Since the frequency and difficulty scales were not interval scales, consideration was given to the use of modal values as more appropriate indicators of central tendencies than mean values would be. Examination of the distributions showed that for many tasks modal frequencies differed very little from mean frequencies, but for some tasks distributions of frequency scores were

nearly rectangular over three, or even four, score categories. Difficulty scores were most often distributed almost equally between two adjacent categories. Mean scores therefore seemed preferable, as descriptive statistics, to modal scores, which would tend to exaggerate frequency and difficulty differences among tasks. The means reported in this study are the total means for all respondents performing the tasks. Differences among respondent groups in frequencies and difficulties of performance of tasks were never large, unless very small numbers of respondents were involved, and their relevance to curriculum construction does not seem sufficient to warrant presentation of frequency and difficulty data in greater detail.

The data on performance and supervision of tasks by percentages of respondents within groups were reduced to the following four categories for tabular presentation:

1. 0 to 24% — Tasks in this category are those whose performance is required in few facilities and which could therefore be omitted from general curricula unless other reasons for their inclusion exist and are judged to deserve greater weight than the evidence that they are usually not performed.

2. 25 to 39% — Tasks in this category probably should be included in curricula, unless judged to be inappropriate on grounds other than the results of the present survey, but they might be given lower priorities or perhaps given consideration for inclusion in secondary optional curricula.

3. 40 to 59% — Tasks in this category would be performed by sufficient numbers of personnel to be considered appropriate for inclusion in general curricula designed for the kinds of personnel who perform them.

4. 60 to 100% — Tasks in this category are those that might be given first priority in curriculum development.

Performance, supervision, frequency, and difficulty data for the complete list of 386 tasks, in numerical sequence, are shown in Tables 10 to 24.

## III. RESULTS

### A. Composition and Characteristics of the Respondent Groups

The designations that have been employed here to identify the five respondent groups were based on some readily apparent gross differences among them with respect to the kinds of tasks they performed. The first two groups were given the designations of "superintendents." They mainly performed tasks in the area of maintenance management, and supervised performance of tasks in other areas. The difference between them was that the first group performed a number of other tasks, mainly those concerned with safety and with fire prevention, that were not performed by the second group. The other three groups performed tasks outside the area of maintenance management, and very few respondents in these groups exercised any supervisory functions. The differences between two of the groups suggested the use of "mechanical maintenance workers" as the designation for one, which performed relatively more tasks dealing with machinery and electrical systems, and the use of "building maintenance workers" as the designation for the other, which performed relatively more tasks related to carpentry and the maintenance of structures. The fifth group was given the designation of "general maintenance workers" because it was the one that performed the greatest variety of tasks, including all of those done by either mechanical or building maintenance workers.

Table 3 shows the composition of the five respondent groups in terms of position titles. The two superintendent groups contained all the department heads in the sample, and each also included a few supervisory personnel below the level of department head. Some of the assistant department heads and other respondents whose titles seemed to identify them as supervisors rather than workers, however, had patterns of task performance that classified them functionally as workers. None of the engineers* was similar in pattern of task performance to either group of superintendents, and most of them were classifiable as general maintenance workers. Some of the craftsmen (the carpenters in particular) had patterns of task performance that caused them to be classified into one or another of the groups of maintenance workers, but most of the firemen and electricians showed no similarities to any of the groups or even among themselves. The group that was most heterogeneous with respect to the position titles represented within it was the general maintenance workers, but neither the eight engineers nor any other set of respondents in this group formed a distinguishable subcluster in terms of patterns of task performance.

The distributions of respondents in the five groups according to hospital size are shown in Table 4 . For the superintendents, the proportion of respondents from small hospitals and extended-care facilities was greater in the first group than in the second, in which the majority were from large hospitals. Probably there is some tendency for department heads in smaller facilities, where the department head himself may be the only supervisor of maintenance, to perform certain tasks that in larger facilities are more

*Twelve respondents who were not department heads or assistant department heads had position titles that included the term "engineer." Possession of such a title, however, does not necessarily indicate performance of true engineering functions. In some maintenance departments all personnel are "engineers."

likely to be performed by other supervisory personnel. Among the groups of workers, the greatest difference was between the distributions for mechanical and building maintenance workers. The proportion of respondents from large hospitals was high among the mechanical maintenance workers and low among the building maintenance workers, and a greater proportion of the latter group were from small hospitals and extended-care facilities.

The previous occupations of the respondents, as shown in Table 5, were quite varied. Few respondents in any of the groups had not previously worked in some occupation other than hospital engineering or maintenance. Some of the superintendents had previously held positions as engineers outside the health care field, but most of them had done some other type of work. Relatively few of the workers had previously been employed in maintenance work in industrial or other areas. Some had earlier experience in construction or other trades, but many had entered their present positions from occupations not directly related to maintenance work. These data seem to indicate that hospital maintenance work usually is not an initial career choice, and the small proportion of superintendents having previous employment as maintenance workers suggests that it does not offer many opportunities for advancement from the level of worker to that of superintendent.

Educational levels, as would be expected, were higher for superintendents than for workers. All but a few of the superintendents, as shown in Table 6, had high school diplomas, and a majority in each group had some college education, although few had obtained college degrees. The workers usually had no further academic education beyond high school. The least well-educated group was the mechanical maintenance workers, less than half of whom had completed high school. Other types of training received by the respondents are shown in Table 7. Most superintendents and workers had taken some craft or specialty courses related to maintenance work, but a considerable proportion of workers did not indicate that they had taken any courses in maintenance work or related subjects. Most of the superintendents presumably had received their engineering training in college; only some of them had taken further courses in engineering.

Less than half of the superintendents, as shown in Table 8, were licensed stationary engineers. Many practicing engineers who are eligible for licenses, however, may have little motivation to apply for them unless local ordinances require licensing of all plant supervisors. Some superintendents and some workers in each group held craft licenses (e.g., plumber, maintenance electrician), but many of the superintendents and most of the workers had no license or certificate in either engineering or a craft. Formal qualifications of this kind evidently are not a usual requirement for employment in a hospital maintenance department.

The mean ages, lengths of time in present position and in present occupation, and salaries of the respondents in the five groups are shown in Table 9. The workers were about the same average age as the superintendents, and did not differ much from the superintendents in length of time in present occupation. It can be seen from a comparison of ages with years in present occupation that superintendents and workers both tend to enter hospital maintenance work after having spent a substantial amount of time in other occupations. These findings are consistent with the inferences drawn from the data shown in

Table 5, to the effect that hospital maintenance work is seldom an initial career choice and is one in which there is little upward mobility. Other data shown in Table 9 provide some indications that stability of employment among maintenance personnel may tend to be greater in larger facilities than in smaller ones. The building maintenance workers as a group indicated the shortest average time in their present position, in terms of both number of years and time relative to total time in present occupation. The first group of superintendents, like the building maintenance workers, included relatively few respondents from large hospitals. They had on the average been in their present positions for a smaller proportion of their total time in the occupation than had the second group, which included a high proportion of respondents from large hospitals.

TABLE 3

NUMBERS OF RESPONDENTS WITHIN

FIVE GROUPS

| Position | DOT* | Superintendents (1) | Superintendents (2) | Maintenance Workers Gen. | Maintenance Workers Mech. | Maintenance Workers Bldg. | Not Classified |
|---|---|---|---|---|---|---|---|
| Department Head | 187.168 | 13 | 12 | 0 | 0 | 0 | 0 |
| Asst. Dept. Head | - | 3 | 0 | 2 | 1 | 0 | 0 |
| Supervisor | 899.131<br>950.131 | 3 | 3 | 2 | 1 | 0 | 1 |
| Engineer** | 950.782 | 0 | 0 | 8 | 2 | 0 | 2 |
| Maintenance Worker | 638.281<br>899.884 | 0 | 0 | 14 | 19 | 22 | 2 |
| Carpenter | 860.281 | 0 | 0 | 4 | 0 | 2 | 1 |
| Electrician | 829.281 | 0 | 0 | 0 | 1 | 0 | 4 |
| Fireman | 951.885 | 0 | 0 | 1 | 0 | 1 | 4 |
| Plumber | 862.381 | 0 | 0 | 0 | 1 | 0 | 0 |
| Janitor | 381.887 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total | - | 19 | 15 | 31 | 25 | 25 | 15 |

*Occupational code designations in the Dictionary of Occupational Titles of the U.S. Department of Labor.

**Stationary engineers and other respondents below the level of Assistant Department Head whose position titles included the term "engineer."

TABLE 4

TYPES OF HOSPITALS AT WHICH RESPONDENTS WERE EMPLOYED

(Percentages within respondent categories)

| Group | Large Hospitals | Medium Hospitals | Small Hospitals | Extended-Care Facilities |
|---|---|---|---|---|
| Superintendents (1) | 26 | 42 | 21 | 11 |
| Superintendents (2) | 60 | 33 | 7 | 0 |
| General Maintenance Workers | 42 | 39 | 16 | 3 |
| Mechanical Maintenance Workers | 72 | 20 | 4 | 4 |
| Building Maintenance Workers | 8 | 56 | 16 | 20 |
| Total | 41 | 39 | 13 | 8 |

TABLE 5

PREVIOUS OCCUPATIONS OF RESPONDENTS

(Percentage distributions within respondent categories)

| Group | Engineer | Maint. Worker | Constr. Trades | Other Trades | Other Occup. | None |
|---|---|---|---|---|---|---|
| Superintendents (1) | 37 | 21 | 5 | 26 | 11 | 0 |
| Superintendents (2) | 27 | 13 | 7 | 20 | 13 | 20 |
| General Maintenance Workers | 0 | 3 | 29 | 19 | 39 | 10 |
| Mechanical Maintenance Workers | 4 | 16 | 8 | 28 | 24 | 20 |
| Building Maintenance Workers | 0 | 0 | 28 | 20 | 40 | 12 |

TABLE 6

ACADEMIC EDUCATION OF RESPONDENTS

(Percentage distributions within respondent categories)

| Group | Less than 9 years | 9 - 12 years | H.S. diploma | Some College | College Degree |
|---|---|---|---|---|---|
| Superintendents (1) | 5 | 11 | 37 | 42 | 5 |
| Superintendents (2) | 0 | 7 | 33 | 47 | 13 |
| General Maintenance Workers | 3 | 23 | 42 | 19 | 3 |
| Mechanical Maintenance Workers | 24 | 28 | 40 | 8 | 0 |
| Building Maintenance Workers | 4 | 28 | 52 | 16 | 0 |

TABLE 7

VOCATIONAL AND OTHER TRAINING RECEIVED BY RESPONDENTS

(Percentage distributions within respondent categories)

| Group | None | On Job Only | Craft or Specialty | Engineering Courses |
|---|---|---|---|---|
| Superintendents (1) | 5 | 5 | 58 | 32 |
| Superintendents (2) | 33 | 0 | 47 | 20 |
| General Maintenance Workers | 26 | 6 | 45 | 19 |
| Mechanical Maintenance Workers | 44 | 0 | 56 | 0 |
| Building Maintenance Workers | 36 | 0 | 64 | 0 |

TABLE 8

LICENSES HELD BY RESPONDENTS

(Percentage distributions within respondent categories)

| Group | Engineer Unlimited | Engineer Limited* | Craft License | None |
|---|---|---|---|---|
| Superintendents (1) | 37 | 0 | 21 | 42 |
| Superintendents (2) | 20 | 20 | 20 | 40 |
| General Maintenance Workers | 0 | 23 | 16 | 61 |
| Mechanical Maintenance Workers | 0 | 0 | 24 | 76 |
| Building Maintenance Workers | 0 | 0 | 20 | 80 |

*Limiting the capacity of equipment the license holder may operate without supervision by a higher rated engineer.

TABLE 9

MEAN AGES, YEARS IN PRESENT POSITION AND IN PRESENT OCCUPATION, AND YEARLY SALARIES OF RESPONDENTS

| Group | Age | Years in Position | Years in Occupation | Salary (Approx.) |
|---|---|---|---|---|
| Superintendents (1) | 46 | 6.1 | 13.6 | $11,000 |
| Superintendents (2) | 54 | 9.7 | 15.2 | $10,800 |
| General Maintenance Workers | 44 | 6.3 | 9.8 | $ 6,400 |
| Mechanical Maintenance Workers | 49 | 7.5 | 14.5 | $ 5,200 |
| Building Maintenance Workers | 49 | 3.2 | 10.4 | $ 5,800 |

## B. Task Performances by Superintendents and Workers

### 1. Maintenance Management (Table 10)

Most of the management tasks listed in this section were performed only by superintendents. The patterns of performance by the two superintendent groups were very similar, although the percentage performing a task was often greater in the first group than in the second. Very few tasks were performed by workers, and most of these only by general maintenance workers. The involvement of mechanical and building maintenance workers in management functions was minimal.

The only tasks either not performed by superintendents or performed by relatively few superintendents were ones dealing with cost records and reports (33, 34, 59, 60) and inventories (35, 36). Preparation of cost reports for individual jobs (59, 60) was not done by either group of superintendents or by any group of workers. Taking of inventories (33, 34), which was not done by the second group of superintendents, was done by some general maintenance workers, but all of the other tasks performed by workers were ones that were also performed by both groups of superintendents.

The most frequently performed tasks were 11, 29, 40 to 48,, 50 to 53, and 55, most of which have to do with arranging day-to-day work schedules. Most other management tasks were not performed more frequently than once a week, and many were performed only about once a month. The difficulty levels of many of the management tasks were close to "moderate" and the proportion which was given mean ratings of 2.0 or higher was greater than in other sections of the task list that covered non-managerial functions. The majority of the management tasks performed by workers were ones with lower difficulty ratings.

TABLE 10

MAINTENANCE MANAGEMENT

Task Performances by Occupational Categories, and Means of Task Frequency and Difficulty Ratings for the Combined Categories

| Task | Percentages of Resp. Performing Task | | | | | | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| | Superintendents* | | | Maintenance Workers | | | | |
| | (1) | (2) | Spv.** | Gen. | Mech. | Bldg. | | |
| 1. Participate in preparation of engineering and maintenance budgets. | ++ | xx | 0 | 0 | 0 | 0 | 3.8 | 2.1 |
| 2. Participate in determining specifications for new equipment or materials. | xx | xx | 0 | + | 0 | 0 | 3.3 | 2.0 |
| 3. Participate in determining specifications for service or supply contracts. | xx | ++ | 0 | 0 | 0 | 0 | 3.6 | 2.1 |
| 4. Participate in planning of maintenance procedures and schedules. | xx | xx | 0 | ++ | 0 | 0 | 2.0 | 1.7 |
| 5. Participate in planning of safety policies and procedures. | xx | xx | 0 | + | 0 | 0 | 3.5 | 1.8 |
| 6. Prepare procedure manuals or guides. | xx | xx | 0 | 0 | 0 | 0 | 3.6 | 2.0 |
| 7. Prepare charts, checklists, or worksheets for inspection and servicing of equipment. | xx | ++ | + | + | 0 | 0 | 3.2 | 1.7 |
| 8. Prepare and maintain equipment record charts. | xx | ++ | + | + | + | 0 | 3.0 | 1.6 |
| 9. Prepare directions for operation and maintenance of equipment by users. | xx | ++ | 0 | 0 | 0 | 0 | 3.1 | 1.6 |
| 10. Consult with administration in planning to meet needs for equipment and services. | xx | xx | 0 | 0 | 0 | 0 | 3.2 | 2.0 |
| 11. Consult with other departments to determine maintenance needs. | xx | xx | 0 | + | + | + | 2.3 | 1.7 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 10 (Continued)

MAINTENANCE MANAGEMENT

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 12. Consult with architects or contractors in planning of major construction or alteration work. | ++ | ++ | 0 | 0 | 0 | 0 | 3.6 | 2.1 |
| 13. Consult with other hospital engineering and maintenance departments. | xx | xx | 0 | 0 | 0 | 0 | 3.8 | 1.5 |
| 14. Consult with other outside engineering agencies. | ++ | xx | 0 | 0 | 0 | 0 | 3.6 | 1.6 |
| 15. Consult with utility services. | ++ | xx | 0 | 0 | 0 | 0 | 3.8 | 1.8 |
| 16. Consult with insurance agencies, fire departments, or other outside agencies. | xx | xx | 0 | 0 | 0 | 0 | 3.7 | 1.5 |
| 17. Interview salesmen. | xx | xx | 0 | 0 | 0 | 0 | 2.5 | 1.6 |
| 18. Give information or assistance to inspectors from government, insurance or other agencies. | xx | xx | 0 | ++ | 0 | 0 | 3.8 | 1.5 |
| 19. Confer with institutions or outside agencies to coordinate emergency and disaster plans. | ++ | ++ | 0 | 0 | 0 | 0 | 3.7 | 1.6 |
| 20. Consult with other institutions or outside agencies to coordinate emergency and disaster plans. | ++ | ++ | 0 | 0 | 0 | 0 | 3.8 | 1.7 |
| 21. Develop work-simplification and cost-reduction methods. | xx | ++ | 0 | 0 | 0 | 0 | 3.9 | 2.0 |
| 22. Develop work performance standards. | xx | xx | 0 | 0 | 0 | 0 | 3.0 | 2.1 |
| 23. Evaluate performance of maintenance workers. | ++ | ++ | 0 | 0 | 0 | 0 | 2.9 | 2.0 |
| 24. Interview and evaluate job applicants. | xx | xx | 0 | 0 | 0 | 0 | 3.2 | 1.8 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 10 (Continued)

MAINTENANCE MANAGEMENT

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 25. Develop and administer in-service training programs. | ++ | ++ | 0 | 0 | 0 | 0 | 3.9 | 1.9 |
| 26. Instruct maintenance workers in new procedures and techniques. | xx | xx | 0 | + | 0 | 0 | 3.0 | 1.8 |
| 27. Give instructions or demonstrations to users in operation and maintenance of equipment. | xx | xx | 0 | 0 | 0 | 0 | 2.9 | 1.6 |
| 28. Schedule boiler shifts and operations. | xx | ++ | 0 | 0 | 0 | 0 | 3.1 | 1.6 |
| 29. Supervise power plant operations. | xx | ++ | + | 0 | 0 | 0 | 2.1 | 1.6 |
| 30. Keep records on inspection, servicing, and repair of structures, systems, equipment, etc. | xx | xx | + | 0 | 0 | 0 | 2.8 | 1.7 |
| 31. Review records to check that prescribed inspection and maintenance schedules are being followed. | xx | xx | 0 | 0 | 0 | 0 | 2.8 | 1.6 |
| 32. Keep records on fuel, water, and power consumption. | ++ | ++ | 0 | 0 | 0 | 0 | 3.0 | 1.6 |
| 33. Review cost records to determine efficiency of operations. | ++ | + | 0 | 0 | 0 | 0 | 3.8 | 1.7 |
| 34. Prepare departmental activity and cost reports. | + | 0 | 0 | 0 | 0 | 0 | 3.7 | 2.0 |
| 35. Take equipment inventories. | ++ | 0 | + | ++ | 0 | 0 | 3.7 | 1.4 |
| 36. Take inventories of engineering and maintenance stores. | + | 0 | + | + | 0 | 0 | 3.5 | 1.4 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 10 (Continued)

MAINTENANCE MANAGEMENT

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 37. Maintain files of blueprints, diagrams, specifications, etc. | xx | ++ | 0 | 0 | 0 | 0 | 3.4 | 1.7 |
| 38. Inspect work performed by outside contractors; verify that contract specifications have been met. | xx | ++ | 0 | 0 | 0 | 0 | 2.8 | 1.9 |
| 39. Receive and review inspection reports; initiate actions to correct reported defects. | xx | ++ | 0 | 0 | 0 | 0 | 2.9 | 2.0 |
| 40. Evaluate work requests; consider necessity for work and availability of money and labor. | xx | ++ | 0 | 0 | 0 | 0 | 1.8 | 2.2 |
| 41. Analyze work request; break down work into units by operations and/or crafts. | xx | ++ | 0 | 0 | 0 | 0 | 1.6 | 1.9 |
| 42. Estimate material and labor costs for jobs. | xx | ++ | 0 | 0 | 0 | 0 | 2.0 | 2.0 |
| 43. Consult with supervisors and foremen to plan and coordinate work schedules. | xx | ++ | 0 | xx | + | 0 | 2.1 | 1.6 |
| 44. Consult with craftsmen in planning of procedures and selection of materials for jobs. | xx | ++ | 0 | + | 0 | 0 | 2.4 | 1.6 |
| 45. Assign priorities to jobs. | xx | xx | 0 | 0 | 0 | 0 | 1.8 | 1.6 |
| 46. Prepare work orders for jobs. | ++ | ++ | + | 0 | 0 | 0 | 1.5 | 1.6 |
| 47. Prepare work plans stating details of work to be performed and specifications for materials or equipment. | xx | ++ | + | 0 | 0 | 0 | 2.2 | 2.0 |
| 48. Prepare requisitions for materials, parts, etc. | xx | ++ | + | 0 | 0 | 0 | 2.0 | 1.9 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 10 (Continued)

MAINTENANCE MANAGEMENT

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 49. Prepare diagrams, plans, or drawings of structures, systems, or equipment. | ++ | ++ | 0 | 0 | 0 | 0 | 3.1 | 1.9 |
| 50. Review and approve work orders and work plans. | xx | ++ | 0 | 0 | 0 | 0 | 1.8 | 1.6 |
| 51. Review and approve requisitions for non-stock items. | ++ | ++ | 0 | 0 | 0 | 0 | 2.0 | 1.6 |
| 52. Assign workers to jobs. | xx | ++ | + | + | 0 | 0 | 1.4 | 1.6 |
| 53. Arrange for availability of job sites, and notify appropriate persons of shutdowns of equipment or facilities. | xx | xx | 0 | + | 0 | 0 | 2.5 | 1.5 |
| 54. Select outside contractors for jobs not performed by maintenance staff. | xx | xx | 0 | 0 | 0 | 0 | 3.4 | 1.7 |
| 55. Visit job sites and inspect work in progress. | xx | xx | 0 | 0 | 0 | 0 | 2.0 | 1.5 |
| 56. Supervise emergency repair work. | xx | xx | 0 | 0 | 0 | 0 | 2.9 | 1.8 |
| 57. Supervise major construction, alteration, or repair. | ++ | ++ | 0 | 0 | 0 | 0 | 3.3 | 2.0 |
| 58. Inspect completed work. | xx | ++ | 0 | 0 | 0 | 0 | 3.1 | 1.7 |
| 59. Receive and file reports | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 60. Prepare final cost | 0 | 0 | 0 | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

2. General Maintenance (Table 11)

The tasks in this section that were performed by both superintendents and workers (61 to 70) are mainly those relating to inspection, checking, and surveying equipment. All of these tasks were performed by the first group of superintendents and also by general maintenance workers, although salvaging parts from discarded equipment (69) was usually only supervised by the superintendents. Inspection and testing of new and stored equipment (64 to 66) was done by the first group of superintendents but not the second group, and by lesser numbers of general maintenance workers.

The tasks performed only by workers (72 to 76) involve handling of materials, preparation and cleaning of job sites, and reporting expenditures of time and materials. These tasks were performed mainly by general maintenance workers. Neither mechanical nor building maintenance workers operated materials-handling equipment (73) or erected scaffoldings or staging (74). Neither superintendents nor workers fabricated templates (71).

The most frequently performed task was that of receiving work requests from other departments (70), which was performed by both groups of superintendents and all groups of workers. Other relatively frequently performed tasks were: transporting materials (72), cleaning up job sites (75) and reporting time and material expenditures (76), which were performed only by workers. Most of the other tasks tended to be performed about once a week.

Tasks rated close to "moderate" in difficulty were: overhauling equipment (63), investigating equipment failures (67), surveying worn or damaged equipment (68), and receiving work requests from other departments (70). All of these tasks were performed by each group of maintenance workers as well as by superintendents, although the first was performed by smaller numbers of mechanical and building maintenance workers. The other three tasks performed by all these groups of maintenance workers (62, 69, 72) were rated about midway between "easy" and "moderate," and all of the tasks performed only by workers (72 to 76) had relatively low difficulty ratings.

TABLE 11

GENERAL MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 61. Read and interpret blueprints, diagrams, specifications, etc. | xx | xx | 0 | ++ | + | 0 | 2.7 | 1.6 |
| 62. Carry out scheduled periodic inspections of structures, systems, or equipment. | xx | ++ | + | xx | ++ | ++ | 2.9 | 1.5 |
| 63. Carry out scheduled periodic overhaul or replacement of parts of equipment or systems. | ++ | + | xx | xx | + | + | 3.2 | 1.8 |
| 64. Inspect equipment or materials delivered by suppliers; check for damage or defects, and verify that specifications have been met. | ++ | 0 | ++ | + | 0 | 0 | 2.8 | 1.6 |
| 65. Test operation of new equipment before placing in service. | xx | 0 | + | ++ | 0 | 0 | 3.7 | 1.6 |
| 66. Inspect and check condition of stored materials or equipment. | ++ | 0 | + | + | 0 | 0 | 3.6 | 1.3 |
| 67. Investigate and determine causes of material or equipment failures. | xx | ++ | + | xx | xx | xx | 2.9 | 1.9 |
| 68. Survey worn or damaged equipment to determine if it should be repaired or replaced. | xx | xx | ++ | xx | ++ | ++ | 2.9 | 1.8 |
| 69. Salvage usable parts from discarded equipment. | + | 0 | xx | xx | ++ | ++ | 2.8 | 1.5 |
| 70. Receive requests from other departments for maintenance or repair work. | xx | ++ | ++ | xx | ++ | ++ | 1.5 | 1.8 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 11 (Continued)

GENERAL MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 71. Fabricate templates. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 72. Transport materials or equipment to and from job sites, workshops, storerooms, etc. | 0 | 0 | + | xx | ++ | + | 1.8 | 1.4 |
| 73. Operate forklifts, hoisting gear, or other materials-handling equipment. | 0 | 0 | + | ++ | 0 | 0 | 2.8 | 1.3 |
| 74. Erect scaffolding or staging. | 0 | 0 | ++ | ++ | 0 | 0 | 3.3 | 1.3 |
| 75. Clean up job sites; dispose of waste materials. | 0 | 0 | ++ | xx | 0 | + | 2.2 | 1.3 |
| 76. Report hours worked and quantities of materials used on jobs. | 0 | 0 | + | ++ | + | 0 | 2.2 | 1.2 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise bud do not perform the task.

3. Power Plant Operation (Table 12)

The operation of boilers and other equipment in the power plant was done principally by general maintenance workers. Some mechanical and building maintenance workers stood watches in the power plant (77), but each group performed only some of the tasks performed by general maintenance workers. Power plant operations were supervised by the superintendents, but only four tasks (79, 81, 85, 87), which were concerned with regulating and observing some of the equipment, were performed by the second group.

Five of the tasks (77, 81, 85, 86, 91) were performed by at least 25% of each group of workers. The observation and recording of operational data (85, 86) were the tasks performed by the highest proportions of both mechanical and building maintenance workers. Some other tasks (78, 82, 87, 90, 92) were performed by one or the other of these groups, but a considerable number were performed only by general maintenance workers. None of the groups of workers regulated distribution of electric power or fuel and gas, or installed boilers (83, 84, 88), although these tasks were supervised by some superintendents. The latter task is probably one that usually is contracted out.

Tasks relating to regulating supply and distribution of power and fuel (78 to 82, and 85 to 87) were performed more frequently than the tasks involving installation and adjustment of boilers and auxiliary equipment (89 to 96), most of which were done less often than once a week. Most of the tasks were rated intermediate between "easy" and "moderate" in difficulty. The most difficult ones, with ratings close to "moderate," involved installation of boiler accessories and auxiliary equipment, and preparation of boilers for service (89 to 91), all of which were performed very infrequently.

TABLE 12

POWER PLANT OPERATION

| Task | Percentages of Reso. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 77. Stand watches in power plant or boiler room. | 0 | 0 | ++ | xx | + | + | 2.1 | 1.6 |
| 78. Regulate operations of steam-generating equipment. | 0 | 0 | ++ | xx | 0 | + | 2.2 | 1.7 |
| 79. Regulate operations of electrical generating equipment. | + | 0 | ++ | ++ | 0 | 0 | 2.8 | 1.6 |
| 80. Regulate operations of compressors. | 0 | 0 | xx | xx | 0 | 0 | 2.6 | 1.5 |
| 81. Regulate operations of heating, air-conditioning, and other systems. | + | 0 | ++ | xx | ++ | + | 2.0 | 1.7 |
| 82. Regulate water and steam distribution. | 0 | 0 | ++ | xx | + | 0 | 2.3 | 1.5 |
| 83. Regulate electric power distribution. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 84. Regulate fuel and gas distribution. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 85. Check operating condition of equipment by observation of water columns, pressure gages, meters, etc. | ++ | 0 | ++ | xx | xx | xx | 1.7 | 1.6 |
| 86. Record temperatures, pressures, and other operational data. | 0 | 0 | ++ | ++ | ++ | ++ | 1.9 | 1.4 |
| 87. Observe fuel gages, flow meters, etc., and record data on fuel, water, and power consumption. | + | 0 | ++ | ++ | 0 | + | 1.9 | 1.5 |
| 88. Install boilers and furnaces. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 89. Install boiler accessories and connections. | 0 | 0 | ++ | xx | 0 | 0 | 3.9 | 1.9 |

KEY TO SYMBOLS: 0 = perofrmed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 12 (Continued)

POWER PLANT OPERATION

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 90. Install air heaters, pumps, or other auxiliary equipment. | 0 | 0 | ++ | xx | + | 0 | 3.8 | 1.9 |
| 91. Prepare boilers for service. | 0 | 0 | xx | xx | + | + | 3.8 | 1.8 |
| 92. Start boilers; raise temperatures and pressures to operating levels. | 0 | 0 | xx | xx | 0 | ++ | 3.5 | 1.6 |
| 93. Adjust rate of firing of boilers to meet demands and maintain efficient operation. | 0 | 0 | ++ | xx | 0 | 0 | 2.8 | 1.4 |
| 94. Adjust boiler feed water controls. | 0 | 0 | ++ | xx | 0 | 0 | 3.5 | 1.5 |
| 95. Adjust fuel combustion controls. | 0 | 0 | ++ | xx | 0 | 0 | 3.5 | 1.5 |
| 96. Regulate operations of automatic stokers, pumps, and other auxiliary equipment. | 0 | 0 | ++ | ++ | 0 | 0 | 3.0 | 1.3 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

4. Power Plant Maintenance (Table 13)

Routine maintenance and cleaning of boilers and other power plant equipment (97 to 109) were done by general maintenance workers and by building maintenance workers, but with most tasks being performed by relatively fewer workers in the latter group. Repair work (110 to 119) also was more likely to be done by general maintenance workers. The only repairs performed by building maintenance workers were replacing water glasses on boilers (112), replacing valves, gages, or meters (113), and repairing pumps and other auxiliary equipment (115). Analysis and treatment of boiler feed water (122, 123) were done by both general and building maintenance workers. The activities of mechanical maintenance workers in this area were limited to performance of tasks related to maintenance and repair of valves, pumps, and some other auxiliary equipment (107, 108, 113, 114, 115).

All of the maintenance tasks performed by workers were supervised by superintendents, and four tasks (110, 111, 117, 121) not performed by any of the groups of workers were nonetheless supervised by at least some superintendents. The latter may be tasks that would require the services of outside contractors. The only task performed by superintendents was the inspection of boilers and furnaces (103), which was also performed by general maintenance workers and building maintenance workers.

The most frequently performed tasks were ones involving checking the operation of boilers (97 to 101) and analysis and treatment of boiler feed water (122, 123), which usually were performed at least once a week. The frequencies of performance of most other tasks in this area tended to be close to once a month. The most difficult task was repairing furnaces (119), one that was done infrequently and by only some general maintenance workers. The majority of the tasks were rated intermediate between "easy" and "moderate" in difficulty.

TABLE 13

POWER PLANT MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 97. Test boiler safety valves. | 0 | 0 | xx | xx | 0 | + | 2.6 | 1.4 |
| 98. Test gage cocks and water level controls. | 0 | 0 | ++ | xx | 0 | + | 2.6 | 1.5 |
| 99. Check operation of burner assemblies, steam nozzles, and other boiler accessories. | 0 | 0 | ++ | xx | 0 | 0 | 2.7 | 1.5 |
| 100. Blow down water columns and gage glasses. | 0 | 0 | xx | xx | 0 | xx | 2.3 | 1.4 |
| 101. Blow down boilers. | 0 | 0 | xx | xx | 0 | xx | 2.4 | 1.4 |
| 102. Lubricate valves and other boiler accessories. | 0 | 0 | xx | xx | 0 | + | 3.3 | 1.5 |
| 103. Inspect boilers and furnaces for leaks, cracks, corrosion, ash accumulation, etc. | ++ | 0 | ++ | xx | 0 | ++ | 2.8 | 1.6 |
| 104. Clean boiler tubes. | 0 | 0 | xx | xx | 0 | + | 3.9 | 1.6 |
| 105. Clean boilers. | 0 | 0 | xx | xx | 0 | ++ | 3.8 | 1.7 |
| 106. Clean water glasses. | 0 | 0 | xx | xx | 0 | + | 3.8 | 1.4 |
| 107. Clean valves, strainers, nozzles, and other boiler accessories. | 0 | 0 | xx | xx | + | + | 3.6 | 1.5 |
| 108. Clean and lubricate pumps and other auxiliary equipment. | 0 | 0 | xx | xx | ++ | ++ | 3.4 | 1.5 |
| 109. Clean boiler furnaces. | 0 | 0 | xx | xx | 0 | + | 3.8 | 1.6 |
| 110. Repair leaks or cracks in boiler plates, casings, settings, etc. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 111. Replace defective tubes. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 112. Replace water glasses. | 0 | 0 | xx | xx | 0 | ++ | 4.0 | 1.5 |
| 113. Replace valves, gages, or meters. | 0 | 0 | xx | xx | xx | + | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 13 (Continued)

POWER PLANT MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 114. Repair or replace other boiler accessories. | 0 | 0 | xx | xx | + | 0 | 3.8 | 1.8 |
| 115. Repair pumps and other auxiliary equipment. | 0 | 0 | xx | xx | xx | + | 3.6 | 1.8 |
| 116. Repair or replace boiler insulation. | 0 | 0 | ++ | ++ | 0 | 0 | 4.0 | 1.7 |
| 117. Repair leaks in furnaces. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 118. Repair or replace combustion chamber linings. | 0 | 0 | ++ | + | 0 | 0 | 3.8 | 1.7 |
| 119. Repair or replace dampers, grates, or other parts of furnaces. | 0 | 0 | + | + | 0 | 0 | 4.0 | 2.1 |
| 120. Measure gas, air, or steam temperatures. | 0 | 0 | ++ | + | 0 | 0 | 3.0 | 1.4 |
| 121. Analyze flue gases. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 122. Analyze boiler feed water. | 0 | 0 | ++ | ++ | 0 | + | 2.7 | 1.5 |
| 123. Treat boiler feed water. | 0 | 0 | xx | xx | 0 | ++ | 2.4 | 1.3 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

5. Plumbing Installation and Metal Work (Table 14)

The installation of pipes, fittings, and plumbing fixtures was done by general maintenance workers and mechanical maintenance workers. The patterns of task performance by these two groups were fairly similar in this area. The principle difference between them was that general maintenance workers did some metal fabrication tasks (127 to 129) and installed water treatment equipment and gas appliances (135, 137), while mechanical maintenance did not. Building maintenance workers did relatively little plumbing installation work. Of the four tasks (126, 131 to 133) performed by building maintenance workers, only the sharpening or repair of tools or instruments (131) was done by a large percentage. The only task performed by superintendents was determining the types and sizes of pipes and fittings for installations (124), which also was performed by general and building maintenance workers.

The frequencies of performance of the tasks in this area ranged from once a week to once a month or less, with sheet metal work (127, 128) and installation of some kinds of equipment (135 to 138) being done rather infrequently. The difficulty levels of the tasks tended to be a little higher than those in most other areas. Several of them (127 to 129, 134, 135, 138) were rated close to "moderate" in difficulty.

TABLE 14

PLUMBING INSTALLATION AND METAL WORK

| | Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|---|
| 124. | Determine proper types and sizes of pipes and fittings for plumbing or steam-fitting installations. | ++ | 0 | ++ | ++ | ++ | 0 | 3.4 | 1.6 |
| 125. | Cut and assemble pipes. | 0 | 0 | xx | xx | xx | 0 | 3.4 | 1.6 |
| 126. | Thread metal pipes. | 0 | 0 | xx | xx | xx | + | 3.3 | 1.5 |
| 127. | Cut patterns for sheet metal work. | 0 | 0 | + | + | 0 | 0 | 3.9 | 1.9 |
| 128. | Fabricate sheet metal items. | 0 | 0 | + | + | 0 | 0 | 3.8 | 1.8 |
| 129. | Fabricate or rebuild metal parts for machinery, equipment, furniture, etc. | 0 | 0 | ++ | xx | 0 | 0 | 3.4 | 1.8 |
| 130. | Weld metal joints. | 0 | 0 | ++ | xx | + | 0 | 3.2 | 1.6 |
| 131. | Sharpen or repair tools or instruments. | 0 | 0 | xx | xx | xx | xx | 2.9 | 1.4 |
| 132. | Install pipes, valves, traps, vacuum breakers, and other fittings. | 0 | 0 | xx | xx | xx | + | 3.1 | 1.6 |
| 133. | Install plumbing fixtures such as sinks, toilets, sprinklers. | 0 | 0 | xx | xx | xx | + | 3.3 | 1.6 |
| 134. | Install convectors, heating coils, or other steam-using equipment. | 0 | 0 | ++ | ++ | ++ | 0 | 3.4 | 1.8 |
| 135. | Install chlorinators, water softeners, or other water treatment equipment. | 0 | 0 | + | ++ | 0 | 0 | 4.0 | 2.0 |
| 136. | Install pressure charge assemblies and reducting valves. | 0 | 0 | ++ | ++ | ++ | 0 | 3.8 | 1.7 |
| 137. | Install gas appliances. | 0 | 0 | + | + | 0 | 0 | 3.8 | 1.7 |
| 138. | Install pumps. | 0 | 0 | ++ | xx | ++ | 0 | 3.9 | 1.9 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

6. Plumbing Maintenance (Table 15)

Plumbing maintenance tasks were performed mainly by general maintenance workers and mechanical maintenance workers, with relatively few differences existing between these two groups. Only six of the tasks performed by general maintenance workers (142, 148, 152, 160, 166, 175) were not also performed by mechanical maintenance workers, and some of these were not performed by many general maintenance workers. The tasks performed by building maintenance workers (139, 140, 145 to 147, 149, 153 to 155, 157 to 159, 161 to 163, 168, 169) were mainly those involving cleaning and repair of pipes, some kinds of fixtures, and pumps, all of which were performed by general and mechanical maintenance workers. The building maintenance workers did not perform any of the tasks related to maintenance of pressure vessels (148, 164 to 167), gas appliances (172 to 174), and water treatment equipment (175), and they inspected steam-using equipment (168,169) but did not clean and repair it (170, 171).

Most of the tasks performed by superintendents (139, 141, 150, 161, 164, 165, 169) were ones having to do with inspection and testing of pipes and fittings, and all were tasks that general and building maintenance workers also performed. Supervision of plumbing maintenance operations by superintendents tended to parallel performance by workers. Testing steam traps (142), thawing frozen pipes (152), repairing china or porcelain fixtures (160) and repairing gas appliances (174) were the tasks performed by the smallest numbers of maintenance workers, and the latter three also were supervised by relatively few superintendents, which suggests that in most facilities they probably are not performed by any maintenance department personnel.

None of the tasks in this area was performed very frequently. Inspection and checking of pipes and fittings were done slightly more often than once a week, while the frequencies of performance of the other tasks ranged from once a week to slightly more often than once a month. The difficulty levels of the tasks ranged from about midway between "easy" and "moderate" to "moderate," with the location and correction of noise conditions in pipes (150) being rated the most difficult. Most of the tasks done by building maintenance workers were performed with frequencies closer to once a week than to once a month, but otherwise no differences in frequency or difficulty were apparent between the tasks performed by building maintenance workers and those performed only by general and mechanical maintenance workers.

TABLE 15

PLUMBING MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 139. Inspect pipes and fittings for leaks, cracks, corrosion, etc. | ++ | 0 | ++ | xx | xx | + | 2.7 | 1.6 |
| 140. Check operation of valves, traps and other fittings. | 0 | 0 | xx | xx | xx | + | 2.7 | 1.5 |
| 141. Check pressures in piping systems with pressure gages. | + | 0 | ++ | xx | + | 0 | 3.0 | 1.5 |
| 142. Test steam traps with test valves. | 0 | 0 | ++ | + | 0 | 0 | 3.9 | 1.5 |
| 143. Adjust settings of pressure-reducing and relief-valve installations. | 0 | 0 | ++ | xx | ++ | 0 | 3.6 | 1.6 |
| 144. Clean pipes; remove dirt, grease, scale. | 0 | 0 | ++ | xx | xx | 0 | 3.6 | 1.5 |
| 145. Clean and lubricate valves, traps, and other fittings. | 0 | 0 | xx | xx | xx | + | 3.4 | 1.6 |
| 146. Repair leaks in piping and connections. | 0 | 0 | xx | xx | xx | xx | 3.2 | 1.6 |
| 147. Replace defective pipes. | 0 | 0 | xx | xx | xx | xx | 3.4 | 1.7 |
| 148. Repair leaks or corrosion spots in tanks and pressure vessels. | 0 | 0 | ++ | ++ | 0 | 0 | 3.7 | 1.6 |
| 149. Repair or replace insulation on pipes and fixtures. | 0 | 0 | ++ | xx | ++ | + | 3.8 | 1.6 |
| 150. Locate and correct noise or vibration conditions in water and steam lines. | ++ | 0 | -- | xx | -- | 0 | 3.8 | 2.0 |
| 151. Adjust or repair joint anchorages, hangers, brackets, etc. | 0 | 0 | ++ | xx | ++ | 0 | 3.4 | 1.6 |
| 152. Thaw frozen pipes. | 0 | 0 | + | + | 0 | 0 | 3.7 | 1.4 |
| 153. Clear stoppages in drain lines. | 0 | 0 | xx | xx | xx | xx | 3.1 | 1.7 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 15 (Continued)

PLUMBING MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 154. Repair or replace defective parts of plumbing fixtures. | 0 | 0 | xx | xx | xx | xx | 3.0 | 1.6 |
| 155. Repair tank flushing assemblies. | 0 | 0 | ++ | ++ | ++ | ++ | 3.2 | 1.6 |
| 156. Repair or replace sprinkler heads. | 0 | 0 | ++ | ++ | ++ | 0 | 3.7 | 1.5 |
| 157. Repair leaks in valves, traps, or other fittings. | 0 | 0 | xx | xx | xx | ++ | 3.3 | 1.6 |
| 158. Replace washers or diaphragms. | 0 | 0 | xx | xx | xx | xx | 3.1 | 1.6 |
| 159. Replace other parts of valves, traps, or other fittings. | 0 | 0 | xx | xx | xx | ++ | 3.3 | 1.7 |
| 160. Repair chips and cracks in china or porcelain fixtures. | 0 | 0 | + | + | 0 | 0 | 3.7 | 1.4 |
| 161. Inspect pumps; check pump pressures, packing, alignments, etc. | + | 0 | xx | xx | xx | ++ | 3.1 | 1.6 |
| 162. Clean and lubricate pumps. | 0 | 0 | xx | xx | xx | xx | 3.6 | 1.5 |
| 163. Adjust or repair pumps; replace packing, bearings, rings, or other parts. | 0 | 0 | xx | xx | xx | ++ | 3.6 | 1.8 |
| 164. Inspect autoclaves and other pressure vessels; check vents, valves, traps, etc. | + | 0 | ++ | xx | xx | 0 | 3.1 | 1.8 |
| 165. Test pressure vessel safety valves. | + | 0 | ++ | xx | + | 0 | 3.3 | 1.5 |
| 166. Drain and clean pressure vessels. | 0 | 0 | xx | ++ | 0 | 0 | 3.8 | 1.6 |
| 167. Adjust or repair pressure vessels; replace worn or defective parts. | 0 | 0 | xx | xx | ++ | 0 | 3.8 | 1.8 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 15 (Continued)

PLUMBING MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 168. Inspect radiators, convectors, heating coils; check valves, connections, etc. | 0 | 0 | xx | xx | xx | xx | 3.3 | 1.6 |
| 169. Inspect other steam-using equipment in laundries, kitchens, etc.; check valves, traps, exhaust lines, etc. | + | 0 | ++ | ++ | ++ | 0 | 3.7 | 1.6 |
| 170. Clean steam-using equipment. | 0 | 0 | ++ | ++ | ++ | 0 | 3.7 | 1.6 |
| 171. Adjust or repair steam-using equipment. | 0 | 0 | xx | xx | xx | 0 | 3.5 | 1.7 |
| 172. Inspect gas appliances; check burners, valves, vents, etc. | 0 | 0 | ++ | ++ | + | 0 | 3.4 | 1.5 |
| 173. Locate and repair leaks in gas appliances and connections. | 0 | 0 | ++ | ++ | ++ | 0 | 3.7 | 1.8 |
| 174. Adjust or repair gas appliances; replace parts of burner assemblies, pressure regulators, etc. | 0 | 0 | + | + | + | 0 | 3.8 | 1.7 |
| 175. Inspect and service chlorinators or other water treatment equipment. | 0 | 0 | ++ | ++ | 0 | 0 | 3.4 | 1.6 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

7. Electrical Installation and Testing (Table 16)

Installation of electrical wiring and fixtures (176 to 184) was done by both general and mechanical maintenance workers, but only some of the latter group performed electrical installation tasks. All of the tasks related to testing of electrical circuits and equipment that were performed by general maintenance workers (188 to 193, 195, 197 to 201), however, also were performed by mechanical maintenance workers. The only tasks in this area done by building maintenance workers were installation of convenience outlets and surface extension wiring (179), location of circuit defects (189), testing of emergency generators and lighting (200), and testing and charging batteries (201).

The task most likely to be performed by superintendents was the inspection of building wiring systems (197). The only other tasks in this area performed by at least some superintendents were the location of circuit defects (189), inspection of power panels (198), and testing of emergency generators and lighting (200). Two of the tasks not performed by any group of maintenance workers, testing conductivities of surfaces (194) and testing electronic components (196), were supervised by some superintendents, and might be tasks performed only by electricians or electronics technicians. The other task not performed by maintenance workers, the installation of generators and transformers (186), was not supervised by superintendents, and probably would be performed by outside contractors when necessary.

The tasks relating to testing of circuits and equipment were performed with frequencies close to once a week, and most of them were rated about midway between "easy" and "moderate" in difficulty. The tasks related to installation work were performed less frequently, and mostly were rated closer to "moderate" than to "easy" in difficulty. The most difficult tasks were installation of wiring and connections for motors and machinery (182), installation of machinery (187), and location of circuit defects (189).

TABLE 16

ELECTRICAL INSTALLATION AND TESTING

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 176. Determine proper types and sizes of wires and conduits for electrical installations. | 0 | 0 | + | + | 0 | 0 | 3.7 | 1.7 |
| 177. Cut and shape conduits for building wiring. | 0 | 0 | ++ | ++ | 0 | 0 | 3.6 | 1.7 |
| 178. Install conduits and wiring for power, lighting, or communication systems. | 0 | 0 | ++ | ++ | + | 0 | 3.6 | 1.7 |
| 179. Install convenience outlets and surface extension wiring. | 0 | 0 | ++ | xx | + | + | 3.5 | 1.7 |
| 180. Install fixtures for lighting and communication systems. | 0 | 0 | ++ | ++ | + | 0 | 3.5 | 1.7 |
| 181. Install control panels, switches, meters, fuses, etc. | 0 | 0 | + | ++ | 0 | 0 | 3.6 | 1.6 |
| 182. Install wiring and power connections for motors and machinery. | 0 | 0 | ++ | ++ | + | 0 | 3.7 | 1.8 |
| 183. Install grounds on machinery and equipment. | 0 | 0 | ++ | xx | + | 0 | 3.4 | 1.5 |
| 184. Seal electrical installations in hazardous areas. | 0 | 0 | + | + | 0 | 0 | 3.7 | 1.6 |
| 185. Install motors and drive assemblies. | 0 | 0 | ++ | xx | xx | 0 | 3.7 | 1.7 |
| 186. Install generators and transformers. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 187. Install machinery or equipment in kitchens, laundries, laboratories, etc. | 0 | 0 | ++ | xx | ++ | 0 | 3.7 | 1.9 |
| 188. Measure currents, voltages, resistances, etc., in electrical circuits and equipment. | 0 | 0 | ++ | ++ | ++ | 0 | 3.1 | 1.5 |
| 189. Locate defects such as short circuits and bad connections. | + | 0 | ++ | xx | xx | xx | 3.1 | 1.8 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 16 (Continued)

ELECTRICAL INSTALLATION AND TESTING

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 190. Test circuits for continuity and current leakages. | 0 | 0 | ++ | ++ | ++ | 0 | 3.0 | 1.5 |
| 191. Test circuits and equipment for overloads and underloads. | 0 | 0 | ++ | ++ | ++ | 0 | 3.3 | 1.6 |
| 192. Check line voltages on lamps or other fixtures. | 0 | 0 | ++ | ++ | ++ | 0 | 3.3 | 1.4 |
| 193. Test ground and insulation resistances. | 0 | 0 | ++ | ++ | ++ | 0 | 3.3 | 1.4 |
| 194. Test conductivities of floor or other surfaces. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 195. Test fuses and circuit breakers. | 0 | 0 | ++ | xx | xx | 0 | 3.3 | 1.5 |
| 196. Test vacuum tubes and other electronic components. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 197. Inspect building wiring systems; check for worn insulation, loose wires, bad connections, etc. | ++ | 0 | + | ++ | + | 0 | 3.2 | 1.5 |
| 198. Inspect power control and distribution panels; check switches, relays, fuses, etc. | + | 0 | ++ | + | + | 0 | 3.2 | 1.4 |
| 199. Inspect and check operation of lighting and communications fixtures. | 0 | 0 | ++ | ++ | + | 0 | 3.0 | 1.5 |
| 200. Test operation of emergency generators and lighting. | + | 0 | xx | xx | ++ | ++ | 3.1 | 1.5 |
| 201. Test and charge batteries. | 0 | 0 | ++ | xx | ++ | + | 3.4 | 1.4 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

6. Electrical Systems and Machinery Maintenance (Table 17)

Maintenance of electrical systems and fixtures, as well as motors and various machinery, was done by both general and mechanical maintenance workers. The pattern of task performance of these two groups were very similar in this area. The principal difference between them was the fact that inspection of operating room and laboratory equipment (209) was done only by the general maintenance workers. Building maintenance workers performed the same kinds of repair work on electrical fixtures as did general and mechanical maintenance workers, although fewer of them repaired building wiring (202). They also did inspection, cleaning, and lubrication of motors and machinery (210 to 212) and some repair work on machinery and tools (226, 227), but did perform the more extensive kinds of repairs to motors and machinery that were done by general and mechanical workers (213 to 219, 222, 223, 225). The only task performed by some superintendents was the inspection of motors and generators (207).

The inspection of transformers (208), heating or baking of motors (221), and repair of electronic equipment (224) were not performed by any group of maintenance workers, and repair of communications fixtures (205) and refinishing parts of motors (220) were performed only by some of the general maintenance workers. Inspection of transformers and repair of communications fixtures, which were supervised by more than 40% of the supervisors, may be done by other personnel in some maintenance departments. Probably heating or baking of motors, which was not supervised by superintendents, is a task not performed in maintenance departments.

Frequencies of performance of most tasks in this area ranged from once a week to perhaps two or three times a month. The only task performed more frequently than once a week was repair of pneumatic tube systems (222). The difficulty levels of the tasks generally tended more in the direction of "moderate" than "easy." The ones rated closest to "moderate" (216, 219, 222, 225 to 227) all were tasks involving repairs of motors or machinery.

TABLE 17

ELECTRICAL SYSTEMS AND MACHINERY MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 202. Repair defects in building wiring and outlets; renew contacts, replace broken wires, worn insulation, etc. | 0 | 0 | xx | xx | xx | + | 3.0 | 1.7 |
| 203. Repair or replace defective switches, relays, circuit breakers, etc. | 0 | 0 | xx | xx | xx | xx | 3.2 | 1.6 |
| 204. Repair or replace lamps, ceiling panels, or other lighting fixtures. | 0 | 0 | xx | xx | xx | xx | 3.1 | 1.6 |
| 205. Repair or replace microphones, speakers, or other communications fixtures. | 0 | 0 | ++ | + | 0 | 0 | 3.4 | 1.6 |
| 206. Repair electrical appliances such as vacuum cleaners, food mixers, electric irons, etc. | 0 | 0 | xx | xx | xx | xx | 3.3 | 1.6 |
| 207. Inspect motors and generators; check temperatures, electrical connections, condition of parts, etc. | + | 0 | ++ | xx | ++ | + | 3.3 | 1.6 |
| 208. Inspect transformers; check temperatures, liquid levels, etc. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 209. Inspect and check operation of operating room and laboratory machinery and equipment. | 0 | 0 | ++ | xx | 0 | 0 | 3.4 | 1.6 |
| 210. Inspect and check operation of machinery in kitchens, laundries, shops, etc. | 0 | 0 | ++ | xx | ++ | + | 3.3 | 1.6 |
| 211. Clean and lubricate motors and generators. | 0 | 0 | xx | xx | xx | xx | 3.3 | 1.5 |
| 212. Clean and lubricate other machinery. | 0 | 0 | xx | xx | xx | xx | 3.2 | 1.5 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 17 (Continued)

ELECTRICAL SYSTEMS AND MACHINERY MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 213. Adjust or repair motors and generators; adjust alignments of parts, replace worn or defective parts. | 0 | 0 | ++ | xx | ++ | 0 | 3.2 | 1.7 |
| 214. Repair defect in wiring and power connections; renew wiring, adjust contacts, replace defective switches, etc. | 0 | 0 | ++ | xx | ++ | 0 | 3.2 | 1.7 |
| 215. Adjust or repair housings, mountings, or supports of motors or other machinery. | 0 | 0 | ++ | xx | xx | 0 | 3.5 | 1.7 |
| 216. Adjust or repair drive assemblies, clutch mechanisms, brakes, etc. | 0 | 0 | ++ | ++ | ++ | 0 | 3.6 | 1.9 |
| 217. Adjust tensions or settings of brushes, commutators, belts, etc. | 0 | 0 | ++ | xx | ++ | 0 | 3.5 | 1.7 |
| 218. Replace brushes, commutators, armatures, or other electrical parts. | 0 | 0 | ++ | ++ | ++ | 0 | 3.5 | 1.6 |
| 219. Replace bearings, rings, shaft sleeves, or other mechanical parts. | 0 | 0 | ++ | xx | xx | 0 | 3.6 | 1.8 |
| 220. Refinish or rebuild bearing seats, shaft sleeves, or other parts of motors or machinery. | 0 | 0 | + | + | 0 | 0 | 3.8 | 1.5 |
| 221. Heat or bake motors to remove moisture. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 222. Adjust or repair pneumatic tube systems. | 0 | 0 | + | ++ | ++ | 0 | 2.5 | 1.9 |
| 223. Adjust or repair operating room equipment such as suction machines and spark gap machines. | 0 | 0 | xx | xx | xx | 0 | 3.5 | 1.7 |
| 224. Adjust or repair electronic equipment such as diathermy machines and X-ray machines. | 0 | 0 | + | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 17 (Continued)

ELECTRICAL SYSTEMS AND MACHINERY MAINTENANCE

| Task | Percentages of Resp. Performing Task | | | | | | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| | Superintendents* (1) | (2) | Spv.** | Maintenance Workers Gen. | Mech. | Bldg. | | |
| 225. Adjust or repair other clinical and laboratory equipment such as respirators, incubators, centrifuges, etc. | 0 | 0 | ++ | ++ | ++ | 0 | 3.5 | 1.0 |
| 226. Adjust or repair other machinery in kitchens, laundries, shops, etc. | 0 | 0 | xx | xx | xx | xx | 3.2 | 1.0 |
| 227. Adjust ore repair portable power tools. | 0 | 0 | xx | xx | ++ | ++ | 3.4 | 1.8 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

9. Refrigeration and Air-Conditioning (Table 18)

The installation, testing, and maintenance of refrigeration and air-conditioning systems were done by general and mechanical maintenance workers, with relatively few tasks in this area being performed by building maintenance workers. Although mechanical maintenance workers performed most of the same tasks as general maintenance workers, there was some tendency for tasks involving adjustment and repair work (239 to 255) to be performed by lesser percentages of mechanical maintenance workers. The building maintenance workers did no installation, testing, or major repair work. The only tasks they performed were cleaning of equipment (235 to 237), replacement of air filters (245), and adjustment of grilles and dampers in air-conditioning systems (248). The tasks performed by superintendents were the inspection of equipment and testing of valves and other controls (231 to 233), which also were performed by general and mechanical maintenance workers.

Four tasks (229, 241, 242, 251) were not performed by any group of maintenance workers, and three others (238, 249, 254) were performed only by relatively small percentages of general maintenance workers. Some of these tasks might be performed by refrigeration mechanics at some facilities. Others, like installation of duct work (229), which was not supervised by as many as 25% of the superintendents, might usually be contracted out.

Many of the tasks in this area were performed only a little more frequently than once a month. Those most often performed, with frequencies close to once a week, were the three tasks (231 to 233) performed by both workers and superintendents. The difficulty levels of many of the tasks were near the midpoint between "easy" and "moderate." The ones rated as most difficult in this area were the installation of regulating devices (230), balancing of air-conditioning systems (243), and repair of refrigeration and air-conditioning equipment (249). Two of the tasks, cleaning compressed air lines (238) and draining moisture traps (240), which were done only by general maintenance workers, were rated as closer to "easy" than to "moderate" in difficulty.

TABLE 18

REFRIGERATION AND AIR-CONDITIONING

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 228. Install refrigerating and air-conditioning equipment. | 0 | 0 | + | ++ | + | 0 | 3.8 | 1.7 |
| 229. Install duct work, dampers, hoods, etc., for air-conditioning and ventilating systems. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 230. Install thermostats, humidistats, or other regulating devices. | 0 | 0 | + | ++ | + | 0 | 3.7 | 1.9 |
| 231. Inspect refrigerating and air-conditioning equipment; check gage readings, electrical connections, alignments of parts, etc. | ++ | 0 | + | ++ | ++ | 0 | 3.2 | 1.5 |
| 232. Test pressure relief and safety valves. | ++ | 0 | + | + | + | 0 | 3.2 | 1.5 |
| 233. Check operation and accuracy of thermostats and other controls or regulators. | + | 0 | ++ | + | ++ | 0 | 3.0 | 1.6 |
| 234. Test refrigeration systems for leaks. | 0 | 0 | + | + | + | 0 | 3.6 | 1.7 |
| 235. Clean and lubricate motors, compressors, condensers, and other refrigerating and air-conditioning equipment. | 0 | 0 | xx | xx | xx | + | 3.5 | 1.5 |
| 236. Clean air-washing or filtering equipment. | 0 | 0 | ++ | ++ | ++ | + | 3.5 | 1.5 |
| 237. Clean air ducts, ventilators, fans, hoods, etc. | 0 | 0 | xx | xx | xx | xx | 3.8 | 1.5 |
| 238. Clean compressed air lines. | 0 | 0 | ++ | + | 0 | 0 | 3.8 | 1.3 |
| 239. Adjust refrigerating system controls to regulate compression and refrigerant flow. | 0 | 0 | ++ | + | + | 0 | 3.4 | 1.7 |
| 240. Drain moisture traps or compartments. | 0 | 0 | ++ | ++ | 0 | 0 | 3.5 | 1.3 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 18 (Continued)

REFRIGERATION AND AIR-CONDITIONING

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 241. Add or withdraw refrigerant. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 242. Pump down and recharge refrigerating systems. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 243. Adjust valves and dampers to balance air-conditioning or ventilating sytems. | 0 | 0 | ++ | xx | + | 0 | 3.5 | 1.8 |
| 244. Test air filter efficiencies. | 0 | 0 | + | + | + | 0 | 3.5 | 1.7 |
| 245. Replace air filters. | 0 | 0 | xx | xx | xx | ++ | 3.4 | 1.5 |
| 246. Adjust or repair air washers, dust collectors, or other filtering equipment. | 0 | 0 | ++ | ++ | + | 0 | 3.5 | 1.7 |
| 247. Repair duct work; caulk joints, replace worn insulation, etc. | 0 | 0 | ++ | ++ | 0 | 0 | 3.8 | 1.7 |
| 248. Adjust or repair grilles, dampers, louvers, etc. | 0 | 0 | xx | ++ | + | + | 3.9 | 1.6 |
| 249. Repair refrigerating and air-conditioning equipment. | 0 | 0 | ++ | + | 0 | 0 | 3.4 | 1.8 |
| 250. Renew wiring and electrical connections; replace defective switches, relays or other components. | 0 | 0 | ++ | ++ | + | 0 | 3.4 | 1.7 |
| 251. Adjust settings or alignments of parts. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 252. Replace gaskets, bearings, piston rings, or other parts. | 0 | 0 | + | ++ | + | 0 | 3.7 | 1.6 |
| 253. Replace defective valves and connections. | 0 | 0 | ++ | + | + | 0 | 3.7 | 1.5 |
| 254. Repair leaks in refrigerating systems. | 0 | 0 | ++ | + | 0 | 0 | 3.9 | 1.6 |
| 255. Repair leaks in compressed air lines. | 0 | 0 | ++ | ++ | + | 0 | 3.8 | 1.5 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

10. Elevator Maintenance (Table 19)

The maintenance of elevators evidently is a function that is usually contracted out. Most of the tasks in this area were neither performed by maintenance workers nor supervised by superintendents. Only general maintenance workers were involved at all in elevator maintenance, and their activities were limited to inspection (256, 257) and adjusting alignments of parts (260), with the latter task being performed infrequently and by relatively few workers.

TABLE 19

ELEVATOR MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 256. Inspect elevators; check cages, shaftways, hoisting machinery. | 0 | 0 | + | ++ | 0 | 0 | 3.1 | 1.4 |
| 257. Inspect and test elevator control and signal systems. | 0 | 0 | + | + | 0 | 0 | 3.2 | 1.2 |
| 258. Inspect safety cable drums and windings. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 259. Clean and lubricate rails, sheaves, ropes, etc. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 260. Adjust alignments or movements of doors, sheaves, rails, or other parts. | 0 | 0 | 0 | + | 0 | 0 | 3.9 | 1.3 |
| 261. Adjust motors, governors, or other elements to regulate elevator speed. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 262. Adjust elevator brakes. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 263. Adjust rope tensions. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 264. Adjust or renew contacts and wiring; replace defective switches or other components. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 265. Adjust or repair hoisting machinery. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 266. Replace elevator ropes. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 267. Replace other worn or defective mechanical parts. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

11. Carpentry (Table 20)

Most kinds of carpentry work were performed by general maintenance workers and building maintenance workers but not by mechanical maintenance workers. The first group of superintendents performed two tasks, inspection of surfaces and buildings (268, 269), that were not performed by workers, but they did not perform any other tasks in this area. Three tasks relating to construction work (275 to 277) were performed only by general maintenance workers, but all other tasks performed by general maintenance workers also were performed by building maintenance workers. The three tasks performed by mechanical maintenance workers, cutting passages for pipes and conduits (274), and installing and repairing metal furnishings (278, 300), could be considered as being somewhat outside the area of carpentry work.

Preparing glues and adhesives (271) and testing the moisture content of wood (272) apparently are tasks not performed by maintenance personnel, since they were not done by any group of workers or supervised by superintendents. Widening of doorways (282), installation and repair of hydraulic hinges (285, 295), making keys (297), and repairing upholstery (301) were supervised by some superintendents, although not performed by any group of workers, and might be tasks that are performed by other more specialized personnel.

Most of the carpentry tasks were performed rather infrequently, many of them being done only a little more often than once a month. Arranging the storage of lumber (270) was the only task performed more frequently than once a week. This task also was the one rated as the easiest in this area, but it was not performed by many workers. Difficulty ratings for the other tasks generally were intermediate between "easy" and "moderate," the most difficult one being the resurfacing of tables and other furniture (298), which was done only by general maintenance workers.

TABLE 20

CARPENTRY

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 268. Inspect floors, walls, roofs, and other surfaces for cracks, damage, or deterioration. | xx | 0 | ++ | 0 | 0 | 0 | 3.2 | 1.6 |
| 269. Inspect building foundations and trusses for sagging, deformation, etc. | ++ | 0 | + | 0 | 0 | 0 | 3.4 | 1.6 |
| 270. Arrange properly ventilated storage of lumber and other materials. | 0 | 0 | ++ | + | 0 | + | 2.8 | 1.2 |
| 271. Prepare glues and adhesives. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 272. Test moisture content of wood. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 273. Demolish or remove walls or other structural members. | 0 | 0 | ++ | ++ | 0 | ++ | 3.7 | 1.3 |
| 274. Cut holes and passages for pipes and conduits. | 0 | 0 | ++ | xx | ++ | + | 3.6 | 1.6 |
| 275. Construct boxes or crates for shipping or storage. | 0 | 0 | + | ++ | 0 | 0 | 3.8 | 1.7 |
| 276. Construct braces, supports, scaffolds, etc. | 0 | 0 | ++ | ++ | 0 | 0 | 3.9 | 1.4 |
| 277. Construct and install wooden racks, railings, shelves, etc. | 0 | 0 | xx | ++ | 0 | 0 | 3.6 | 1.6 |
| 278. Construct and install metal racks, railings, shelves, etc. | 0 | 0 | ++ | xx | + | + | 3.6 | 1.7 |
| 279. Construct and install partitions. | 0 | 0 | xx | ++ | 0 | + | 3.8 | 1.6 |
| 280. Construct drawers, benches, cupboards, and other furnishings. | 0 | 0 | ++ | + | 0 | ++ | 3.6 | 1.7 |
| 281. Cut and set glass for doors, windows, cabinets, etc. | 0 | 0 | ++ | ++ | 0 | + | 3.8 | 1.5 |
| 282. Widen doorways or window openings. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 20 (Continued)

CARPENTRY

| Task | Percentages of Resp. Performing Task | | | | | | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| | Superintendents* | | | Maintenance Workers | | | | |
| | (1) | (2) | Spv.** | Gen. | Mech. | Bldg. | | |
| 283. Install doors and windows. | 0 | 0 | ++ | + | 0 | ++ | 3.8 | 1.7 |
| 284. Install trim and moldings. | 0 | 0 | ++ | + | 0 | + | 3.5 | 1.6 |
| 285. Install hydraulic hinges. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 286. Install locks, latches, doorstops, and other hardware pieces. | 0 | 0 | xx | xx | 0 | xx | 3.6 | 1.7 |
| 287. Repair doors; trim edges, shim hinges, reset screws, etc. | 0 | 0 | xx | xx | 0 | xx | 3.5 | 1.6 |
| 288. Repair windows; eliminate sticking, replace sash cords, etc. | 0 | 0 | xx | ++ | 0 | xx | 3.5 | 1.5 |
| 289. Replace loose or broken panes of glass. | 0 | 0 | ++ | xx | 0 | xx | 3.5 | 1.6 |
| 290. Putty windows, caulk frames and joints. | 0 | 0 | xx | xx | 0 | ++ | 3.5 | 1.5 |
| 291. Install weather stripping. | 0 | 0 | ++ | xx | 0 | ++ | 3.8 | 1.5 |
| 292. Cut and install metal or plastic screening. | 0 | 0 | ++ | ++ | 0 | ++ | 3.8 | 1.6 |
| 293. Adjust or repair window shades; adjust roller tensions, bracket mountings, etc. | 0 | 0 | ++ | xx | 0 | ++ | 3.5 | 1.6 |
| 294. Adjust or repair venetian blinds; replace cords, tapes, slats, etc. | 0 | 0 | ++ | xx | 0 | xx | 3.6 | 1.5 |
| 295. Adjust or repair hydraulic hinges. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 296. Adjust or repair locks and latches. | 0 | 0 | ++ | xx | 0 | xx | 3.5 | 1.4 |
| 297. Make keys. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 298. Resurface tables, desks, counters, etc. | 0 | 0 | ++ | ++ | 0 | + | 3.7 | 1.8 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 20 (Continued)

CARPENTRY

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 299. Adjust or repair wooden furniture; replace chair rungs, adjust sticking drawers, etc. | 0 | 0 | xx | xx | 0 | xx | 3.7 | 1.5 |
| 300. Adjust or repair metal furniture; adjust swivel mechanisms, replace castors, etc. | 0 | 0 | xx | xx | ++ | xx | 3.5 | 1.5 |
| 301. Repair or renew upholstery. | 0 | 0 | + | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

12. Flooring and Siding Installation and Maintenance (Table 21)

Installation and maintenance of flooring and siding materials were done chiefly by general maintenance workers. Most of the tasks in this area were not performed by building maintenance workers, and none was performed by either mechanical maintenance workers or superintendents. The four tasks done by both general maintenance workers and building maintenance workers were installing floor and wall coverings, laminate surfacings and non-slip materials (303, 305, 308), and repairing damaged floor and wall covering (311). None of the workers installed wooden flooring (302), which is not much used in modern hospital construction, and none shored up floors (313) or adjusted building truss members (314), which perhaps are tasks that would require the services of outside contractors. Installing sound and vibration insulating materials (307) also was not done by any group of workers, although it was supervised by some superintendents and therefore apparently done in some maintenance departments.

All of the tasks in this area were infrequently performed, and all but one of them were rated about midway between "easy" and "moderate" in difficulty. Refinishing of floors and other surfaces (310), which was done by only some general maintenance workers, was considered to be of "moderate" difficulty.

TABLE 21

FLOORING AND SIDING INSTALLATION AND MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 302. Lay wooden flooring. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 303. Lay linoleum, vinyl, rubber, or other floor and wall coverings. | 0 | 0 | xx | xx | 0 | + | 3.7 | ..6 |
| 304. Install fiberboard, plasterboard, or other siding materials. | 0 | 0 | ++ | ++ | 0 | 0 | 3.7 | 1.6 |
| 305. Install laminate surfacings. | 0 | 0 | ++ | + | 0 | + | 3.8 | 1.6 |
| 306. Install thermal insulating materials. | 0 | 0 | ++ | + | 0 | 0 | 3.7 | 1.5 |
| 307. Install sound and vibration insulating materials. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 308. Install non-slip, non-skid materials on floors, stairs or other surfaces. | 0 | 0 | ++ | ++ | 0 | + | 3.9 | 1.5 |
| 309. Replace worn or damaged floorboards, stair treads, moldings, etc. | 0 | 0 | ++ | ++ | 0 | 0 | 3.7 | 1.6 |
| 310. Refinish floors or other surfaces. | 0 | 0 | + | + | 0 | 0 | 3.7 | 2.1 |
| 311. Repair dents, cracks, abrasions, etc., in floor and wall coverings. | 0 | 0 | ++ | ++ | 0 | ++ | 3.8 | 1.6 |
| 312. Tighten loose floorboards or stair treads. | 0 | 0 | ++ | + | 0 | 0 | 3.8 | 1.6 |
| 313. Shore up sagging floors or girders. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 314. Adjust bolts, tie rods, or other parts of building truss members. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

13. Masonry, Roofing, and Grounds Maintenance (Table 22)

Maintenance of masonry and concrete surfaces and roofing repairs were done mainly by general maintenance workers. Several of the tasks in this area, however, including the ones dealing with construction of new surfaces or structures (315, 319) were not performed by many workers or supervised by many superintendents. Replacing damaged bricks (316), patching concrete (320), repairing leaks in roofs (324), and cleaning gutters and downspouts (328) were tasks performed by building maintenance workers as well as by general maintenance workers, but the last two of these tasks were performed by higher percentages of general maintenance workers. Both general and building maintenance workers operated incinerators (331), and some in each group did grounds maintenance work (333). The only task performed by all three groups of workers was removing snow and ice (330), which probably is a task calling for the services of all available personnel whenever the need for its performance arises. Repairing mortar joints (317), treating concrete surfaces (322), and operating waste disposal equipment (332) were not done by any of the groups of workers.

The frequencies of performance of almost all the tasks in this area were close to once a month, the operation of incinerators (331) being the only task performed with a frequency closer to once a week. Two tasks, cleaning stains from concrete or masonry surfaces (321) and repairing leaks in roofs (324), were rated close to "moderate" in difficulty, and all other tasks had ratings of difficulty about midway between "easy" and "moderate."

TABLE 22

MASONRY, ROOFING, AND GROUNDS MAINTENANCE

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 315. Lay bricks, blocks, tiles, etc. for construction of new surfaces or structures. | 0 | 0 | + | + | 0 | 0 | 4.0 | 1.4 |
| 316. Replace worn or damaged bricks, blocks, tiles, etc. | 0 | 0 | ++ | + | 0 | + | 3.9 | 1.4 |
| 317. Repair loose mortar joints. | 0 | 0 | ++ | 0 | 0 | 0 | - | - |
| 318. Prepare concrete mixtures. | 0 | 0 | ++ | ++ | 0 | 0 | 3.8 | 1.6 |
| 319. Pour or lay concrete for new surfaces or structures. | 0 | 0 | + | + | 0 | 0 | 4.0 | 1.4 |
| 320. Patch and repair concrete surfaces. | 0 | 0 | ++ | ++ | 0 | ++ | 3.9 | 1.5 |
| 321. Clean and remove stains from concrete or masonry surfaces. | 0 | 0 | + | + | 0 | 0 | 3.8 | 1.8 |
| 322. Treat concrete surfaces for dusting, chalkiness, efflorescense, etc. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 323. Repair or recoat asphalt or blacktop surfaces. | 0 | 0 | ++ | + | 0 | 0 | 4.0 | 1.6 |
| 324. Repair leaks in roofs. | 0 | 0 | ++ | xx | 0 | + | 3.9 | 1.8 |
| 325. Repair or recoat roll or built-up roofing. | 0 | 0 | + | + | 0 | 0 | 4.0 | 1.5 |
| 326. Replace roof shingles, slates, tiles, etc. | 0 | 0 | + | + | 0 | 0 | 4.0 | 1.5 |
| 327. Repair or renew roof flashings. | 0 | 0 | + | + | 0 | 0 | 3.8 | 1.6 |
| 328. Clean gutters and downspouts. | 0 | 0 | xx | ++ | 0 | + | 4.0 | 1.5 |
| 329. Repair or replace gutters and downspouts. | 0 | 0 | ++ | ++ | 0 | 0 | 3.9 | 1.6 |
| 330. Remove snow and ice from buildings and grounds. | 0 | 0 | ++ | xx | ++ | xx | 3.6 | 1.5 |
| 331. Operate incinerators. | 0 | 0 | ++ | xx | 0 | ++ | 3.2 | 1.6 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 22 (Continued)

MASONRY, ROOFING, AND GROUNDS MAINTENANCE

| Task | Percentages of Resp. Performing Task | | | | | | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| | Superintendents* | | | Maintenance Workers | | | | |
| | (1) | (2) | Spv.** | Gen. | Mech. | Bldg. | | |
| 332. Operate compactors, paper bailing machinery, or other waste disposal equipment. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 333. Maintain grounds; grade and fill, trim trees, plant shrubbery, etc. | 0 | 0 | xx | + | 0 | + | 3.8 | 1.6 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

14. Painting and Plastering (Table 23)

Most tasks related to painting were performed by general maintenance workers, but the percentages who prepared paints and other compounds (346 to 349) were lower than the percentages who applied them (347 to 353). The activities of building maintenance workers in this area were limited mainly to the preparation and painting of different surfaces (344 to 349). Some of them also arranged storage of paints and other solutions (334) and applied finishes (350), but they did not apply other kinds of solutions (351 to 353) or perform various other tasks that were done by general maintenance workers. No tasks in this area were performed by mechanical maintenance workers, and only one, selecting appropriate types of paints (335), was performed by superintendents.

The only plastering tasks performed by maintenance workers were preparing mixtures (354) and patching surfaces (359). Complete plastering operations (355 to 358), although supervised by some superintendents, were not performed by any groups of workers. Wallpapering (360) and fine brushwork (362) also were not done by workers, and only some in the group of general maintenance workers painted signs (361).

None of the tasks in this area was performed as often as once a week. Most of them tended to be performed about two or three times a month. The difficulty ratings of the tasks were intermediate between "easy" and "moderate," but inclining somewhat toward the "moderate" level. Of the tasks rated closest to "moderate" in difficulty (335, 337, 338, 340, 341, 344, 351 to 353), all except preparing wooden surfaces for painting (344) were performed only by general maintenance workers.

TABLE 23

PAINTING AND PLASTERING

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 334. Arrange safe storage of paints, oils, solvents, etc. | 0 | 0 | xx | ++ | 0 | + | 3.3 | 1.6 |
| 335. Select the appropriate types of paints for different surfaces and conditions. | + | 0 | ++ | ++ | 0 | 0 | 3.5 | 1.9 |
| 336. Prepare paints by mixing pigments and vehicles. | 0 | 0 | + | 0 | 0 | 0 | 3.4 | 1.5 |
| 337. Mix paints to match specified colors. | 0 | 0 | + | + | 0 | 0 | 3.9 | 1.8 |
| 338. Prepare finishes, stains, and bleaches. | 0 | 0 | + | + | 0 | 0 | 3.5 | 1.8 |
| 339. Prepare solvents and cleaning solutions. | 0 | 0 | + | + | 0 | 0 | 3.3 | 1.7 |
| 340. Cut stencils for painting signs. | 0 | 0 | + | + | 0 | 0 | 3.6 | 1.9 |
| 341. Wash walls, woodwork, or other building surfaces. | 0 | 0 | 0 | + | 0 | 0 | 3.2 | 1.8 |
| 342. Clean and prepare metal surfaces for painting. | 0 | 0 | ++ | ++ | 0 | 0 | 3.5 | 1.7 |
| 343. Clean and prepare concrete or masonry surfaces for painting or plastering. | 0 | 0 | ++ | + | 0 | 0 | 3.8 | 1.7 |
| 344. Clean and prepare wooden or other surfaces for painting or plastering. | 0 | 0 | ++ | ++ | 0 | + | 3.5 | 1.8 |
| 345. Remove old paint or finishes. | 0 | 0 | ++ | xx | 0 | + | 3.4 | 1.6 |
| 346. Patch or fill holes and cracks in surfaces before painting or plastering. | 0 | 0 | ++ | ++ | 0 | ++ | 3.4 | 1.5 |
| 347. Paint metal surfaces. | 0 | 0 | xx | xx | 0 | ++ | 3.7 | 1.5 |
| 348. Paint concrete or masonry surfaces. | 0 | 0 | ++ | ++ | 0 | + | 3.5 | 1.7 |
| 349. Paint wooden, plaster, or other surfaces. | 0 | 0 | ++ | ++ | 0 | + | 3.5 | 1.7 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 23 (Continued)

PAINTING AND PLASTERING

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 350. Apply shellac, varnish, or other finishes. | 0 | 0 | ++ | xx | 0 | + | 3.5 | 1.7 |
| 351. Bleach or stain wooden surfaces. | 0 | 0 | + | ++ | 0 | 0 | 3.4 | 1.8 |
| 352. Apply sealing compounds to floors or other surfaces. | 0 | 0 | ++ | ++ | 0 | 0 | 3.6 | 1.9 |
| 353. Apply water-repellant, insect-repellent, or other preservative solutions. | 0 | 0 | + | + | 0 | 0 | 3.2 | 1.8 |
| 354. Prepare plaster or stucco mixtures. | 0 | 0 | ++ | + | 0 | 0 | 3.7 | 1.5 |
| 355. Install lath and furring. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 356. Apply plaster or stucco over concrete or masonry surfaces. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 357. Apply plaster or stucco over wooden or other surfaces. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 358. Finish plaster or stucco surfaces by smoothing, grinding, polishing. | 0 | 0 | + | 0 | 0 | 0 | - | - |
| 359. Patch and repair plaster or stucco surfaces. | 0 | 0 | + | + | 0 | + | 3.8 | 1.4 |
| 360. Cut and hang wallpaper. | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 361. Paint signs. | 0 | 0 | + | + | 0 | 0 | 3.8 | 1.4 |
| 362. Do freehand lettering or other fine brushwork. | 0 | 0 | + | 0 | 0 | 0 | - | - |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

### Safety and Fire Protection (Table 24)

The performance of tasks related to safety and fire protection by the first group of superintendents was the principal factor that distinguished them from the second group. Some of the latter group participated in planning of emergency and disaster procedures (365) and arranged for unsafe tools or equipment to be withdrawn from service (384), but in general they were involved only in a supervisory capacity, if at all, in safety and fire protection functions. Three tasks in this area (371, 374, 379) were performed by workers instead of superintendents, although the last of these, refilling fire extinguishers (379) was performed only by a relatively low percentage of general maintenance workers. The other tasks were performed either by superintendents alone or by both superintendents and workers.

Four of the tasks in this area (373, 374, 382, 383) were performed by all three groups of workers and were the only tasks performed by mechanical maintenance workers. Four other tasks (377, 378, 380, 384) were performed by at least some building maintenance workers, but it was mainly the general maintenance workers who were concerned with maintenance of safety and fire protection equipment. The tasks not performed by any groups of workers were the ones that involved record-keeping and planning of procedures (363 to 367) and preparation of reports (385, 386). Some of these tasks, although performed by large percentages of the first group of superintendents, were supervised by few additional superintendents, which perhaps indicates that at some facilities they are functions for which administrators or other personnel outside the maintenance department are responsible.

The frequencies of performance of most of the tasks in this area ranged from nearly once a week to from once a week to once a month, the most frequently performed tasks being directing attention to unsafe conditions (383) and withdrawing unsafe equipment from service (384). The difficulty ratings of most of the tasks were about midway between "easy" and "moderate," but four tasks (363 to 366) that were administrative in nature and performed only by superintendents were rated close to "moderate" in difficulty.

TABLE 24

SAFETY AND FIRE PROTECTION

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 363. Keep records on nature and locacion of hazard sources and safety equipment. | ++ | 0 | ++ | 0 | 0 | 0 | 3.3 | 1.9 |
| 364. Prepare safety regulations governing the use of equipment. | xx | 0 | + | 0 | 0 | 0 | 3.4 | 1.8 |
| 365. Participate in planning of emergency and disaster procedures. | xx | + | + | 0 | 0 | 0 | 3.8 | 1.9 |
| 366. Participate in organizing and evaluating emergency and disaster drills or exercises. | xx | 0 | 0 | 0 | 0 | 0 | 3.8 | 1.9 |
| 367. Keep records on services, equipment, and supplies available for use in emergencies or disasters. | ++ | 0 | + | 0 | 0 | 0 | 3.4 | 1.5 |
| 368. Instruct others in the use of safety and fire protection equipment. | xx | 0 | ++ | + | 0 | 0 | 3.5 | 1.6 |
| 369. Post and maintain signs and instructions for the use of safety and fire protection equipment. | ++ | 0 | ++ | + | 0 | 0 | 3.6 | 1.6 |
| 370. Post and maintain warning signs to indicate special hazards such as high voltages, radiation, etc. | ++ | 0 | ++ | ++ | 0 | 0 | 3.5 | 1.5 |
| 371. Post temporary warnings or out-of-order signs where work is in progress or facilities are out of service. | 0 | 0 | ++ | xx | 0 | 0 | 3.4 | 1.5 |
| 372. Carry out periodic safety inspections. | xx | 0 | + | ++ | 0 | 0 | 3.3 | 1.5 |
| 373. Check machinery guards and other protective devices or equipment. | xx | 0 | + | xx | + | + | 3.0 | 1.3 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

TABLE 24 (Continued)

SAFETY AND FIRE PROTECTION

| Task | Percentages of Resp. Performing Task: Superintendents* (1) | (2) | Spv.** | Maintenance Workers: Gen. | Mech. | Bldg. | Mean Freq. | Mean Diff. |
|---|---|---|---|---|---|---|---|---|
| 374. Adjust or replace protective devices and equipment. | 0 | 0 | xx | xx | + | + | 3.5 | 1.4 |
| 375. Check safety or storage of flammable or other hazardous materials. | xx | 0 | ++ | ++ | 0 | 0 | 3.0 | 1.5 |
| 376. Check operating rooms and other critical areas for hazards. | ++ | 0 | ++ | + | 0 | 0 | 3.2 | 1.4 |
| 377. Check condition of tools, ladders, and materials-handling equipment. | xx | 0 | ++ | xx | 0 | ++ | 3.1 | 1.4 |
| 378. Inspect fire-fighting equipment; check condition of extinguishers, hydrants, pumps, hoses. | ++ | 0 | xx | ++ | 0 | + | 3.3 | 1.6 |
| 379. Refill fire extinguishers; renew or replace other items. | 0 | 0 | ++ | + | 0 | 0 | 3.9 | 1.6 |
| 380. Inspect fire and emergency exits; check operation of locks and latches. | xx | 0 | ++ | ++ | 0 | + | 3.1 | 1.4 |
| 381. Check operation of automatic fire-detection systems and automatic sprinklers. | + | 0 | ++ | + | 0 | 0 | 3.3 | 1.5 |
| 382. Participate in fire drills as a member of the fire brigade. | xx | 0 | ++ | xx | ++ | ++ | 3.8 | 1.5 |
| 383. Direct attention of workers or supervisors to unsafe conditions or practices. | xx | 0 | ++ | ++ | + | + | 2.8 | 1.4 |
| 384. Arrange for unsafe tools or equipment to be withdrawn from service. | xx | + | + | ++ | 0 | + | 2.9 | 1.4 |
| 385. Prepare reports on unsafe conditions or practices. | xx | 0 | + | 0 | 0 | 0 | 3.[illegible] | 1.3 |
| 386. Investigate and prepare reports on accidents or injuries. | xx | 0 | ++ | 0 | 0 | 0 | 3.3 | 1.4 |

KEY TO SYMBOLS: 0 = performed by 0-24%; + = performed by 25-39%; ++ = performed by 40-59%; xx = performed by 60-100%.

*Superintendent categories (1) and (2) are defined on Page 9.

**Percentage of Superintendents who supervise but do not perform the task.

## IV. DISCUSSION

The patterns of task performance found to exist among the survey respondents provide functional definitions of two categories of maintenance superintendents and three categories of maintenance workers for which curricula could be designed. The primary occupational division to which the structure of curricula should conform is between superintendents and workers, but among both superintendents and workers there are further divisions that deserve consideration in the design of curricula.

The patterns of task performance shown by the two categories of superintendents mainly reflect what is done by department heads, who formed the majority within each category. The functions of a maintenance department head are principally managerial. Some department heads are concerned only with the general management and supervision of maintenance operations; others perform additional functions related to safety and the inspection and testing of equipment instead of only exercising supervision over performance of these functions. There seems to be no particular pattern of task performance that is characteristic of intermediate supervisory personnel below the level of department head. Some assistant department heads, maintenance supervisors and others whose position titles would imply supervisory functions perform the same kinds of tasks as department heads, but others perform only tasks that are done by workers.

Differences between the two categories of superintendents have some relation to facility size. It was seen in Table 4 that relatively more superintendents at large facilities were in the category that performed only managerial tasks and relatively more superintendents at small facilities were in the category that performed a wider range of tasks. It may be that large facilities are more likely to have other personnel available to whom the department head can delegate tasks that in smaller facilities no one except the department head himself is qualified to perform. The relation between the numbers of personnel in the maintenance departments surveyed and the numbers of tasks performed by respondents who were heads of departments is shown in Table 25. What is principally evident is a tendency for the heads of large departments to perform fewer tasks than the heads of medium-sized and small departments. Even in small departments, however, the department heads function primarily as managers and do not tend to perform the same kinds of tasks as workers.

Another factor that could be related to performance of safety and fire protection functions by superintendents is the size of the community in which a hospital is located. It is possible that fire departments in large urban communities often assume much of the responsibility for these functions, while in smaller communities a greater part of the responsibility is more likely to devolve upon maintenance superintendents. One of the reasons why superintendents in the second category did not perform tasks related to safety and fire protection therefore might be the fact that 73% of them, as opposed to only 48% of those in the first group, were at facilities situated in communties of over 50,000 population.

Among maintenance workers, three functional categories are distinguishable in terms of kind and degree of specialization. Some of the major similarities and differences between the categories that have been designated here as general, mechanical, and building maintenance workers can be seen in Table 26,

TABLE 25

Relation of Number of Tasks Performed by Department Head to Size of Department

| Number of tasks performed by Department Head | Number of Personnel in Department 1 - 5 | 6 - 10 | Over 10 |
|---|---|---|---|
| Less than 50 | 1 | 3 | 5 |
| 50 to 75 | 2 | 3 | 3 |
| 75 to 100 | 2 | 3 | 1 |
| More than 100 | 1 | 1 | 0 |

which shows the percentages of tasks in different areas performed by workers in these categories. Tendencies toward specialization in different kinds of work by mechanical and building maintenance workers are apparent from the differences between the percentages of tasks that they perform in several of the areas. The work done by mechanical maintenance workers mainly involves plumbing, electrical systems, and machinery. Building maintenance workers also perform some tasks in these areas, and they participate to a greater extent than mechanical maintenance workers do in the operation and maintenance of boilers and other power plant equipment, but they do relatively little installation or major repair work. Most of the overlap in functions between mechanical and building maintenance workers involves routine maintenance and minor repairs of plumbing, electrical fixtures, and some kinds of machinery. Carpentry work and other tasks related to the maintenance of furniture and structures are performed by building maintenance workers but not by mechanical maintenance workers.

What distinguishes general maintenance workers from mechanical and building maintenance workers is not so much the performance of different tasks as the performance of a greater variety of tasks, including all tasks performed by either of the two more specialized categories. While mechanical and building maintenance workers each need to have some of the skills of a number of different trades, neither is required to exercise as broad a range of skills as general maintenance workers. It is not possible to say, however, that one category of workers is more highly skilled than another. No great differences in age, experience, or education of workers in various categories were evident among the survey respondents, and it may be that many mechanical and building maintenance workers possess the same skills as general maintenance workers but hold jobs where employment of all their skills is not required. The existing differences in task performance between categories of workers nevertheless do show that there are positions that could be filled by workers with training limited to the functions actually performed by either mechanical or building maintenance workers.

TABLE 26

Percentages of Tasks in Fifteen Areas Performed by 25% or More of Maintenance Workers

| Area | No. of Tasks | Percentages of tasks performed by Gen. | Mech. | Bldg. |
|---|---|---|---|---|
| Maintenance management | 60 | 23 | 5 | 2 |
| General maintenance | 16 | 94 | 56 | 50 |
| Power plant operations | 26 | 88 | 27 | 50 |
| Power plant maintenance | 21 | 76 | 19 | 52 |
| Plumbing installation | 15 | 100 | 67 | 20 |
| Plumbing maintenance | 37 | 100 | 84 | 46 |
| Electrical installation | 26 | 88 | 73 | 15 |
| Electrical maintenance | 26 | 88 | 77 | 42 |
| Refrigeration and air-cond. | 28 | 86 | 68 | 18 |
| Elevator maintenance | 12 | 25 | 0 | 0 |
| Carpentry | 34 | 73 | 9 | 65 |
| Flooring and siding | 13 | 69 | 0 | 31 |
| Masonry and roofing | 19 | 84 | 5 | 37 |
| Painting and plastering | 29 | 76 | 0 | 31 |
| Safety and fire protection | 24 | 71 | 17 | 33 |

In Appendix IV tasks have been grouped into six blocks to show the divisions into which curriculum content could be organized for training of maintenance superintendents and workers.

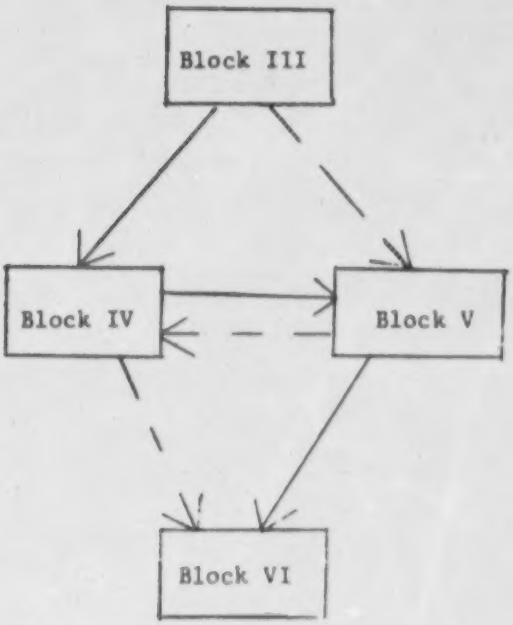
Block I consists of tasks performed by both categories of superintendents. A curriculum to provide training in the performance of these tasks would be appropriate for all maintenance department heads and other supervisory personnel whose functions are principally managerial. Emphasis in such a curriculum probably should be given to general principles of maintenance management and to planning and administration of preventive maintenance programs as well as to specific management procedures. For some superintendents, training in performance of the tasks contained in Block II, which embraces functions related to safety and fire protection and the inspection of certain kinds of equipment, also would be appropriate. Possibly the same training would be suitable for other superintendents who supervise but do not perform these tasks. Many of the tasks in Block II involve activities for which proficiency in performance might be the principal requirement for effective supervision. Supervision of other kinds of tasks, however, might better be taught to superintendents in courses designed differently from those intended to teach performance to workers. It seems likely that the knowledge and skills needed for supervision of many maintenance operations are not the same as those required for their performance. Supervision may often be remote from performance and consist essentially of planning and authorizing the performance of work and verifying its proper completion. What might be most appropriate for superintendents are courses that identify maintenance needs and deal with supervised tasks primarily in terms of scheduling work and applying performance standards. The tasks that might be covered in courses of this kind are those shown in Blocks III to VII which are supervised but not performed by superintendents.

Blocks III to VI contain the tasks that would be taught in curricula designed for maintenance workers. The tasks in Block III are the ones that all workers should be able to perform. They represent a variety of functions in several different areas and include certain kinds of maintenance work on pipes, plumbing fixtures, pumps and some other types of machinery, as well as electrical fixtures. This block can be combined in different ways with the other blocks to construct curricula for particular categories of maintenance workers.

The training required for mechanical maintenance workers is chiefly in the areas of plumbing and maintenance of steam-using equipment, testing and inspection of electrical equipment and refrigeration systems, and repair of motors and machinery. This would be provided in a curriculum based on the combination of Block IV with Block III. The kind of training needed for building maintenance workers, which is mainly in carpentry work, painting, and the operation and maintenance of boilers, would be provided by a curriculum based on the combination of Block V with Block III. Completion of either of these curricula would qualify workers for employment in hospital maintenance work. Positions that could be filled by individuals trained as mechanical maintenance workers are more likely to exist in large hospitals, while positions for building maintenance workers are more likely to exist in smaller facilities.

FIGURE 1

ALTERNATE TRAINING SEQUENCES
FOR MAINTENANCE WORKERS




——→ Sequence for qualification first as a mechanical maintenance worker and progression to qualification as a general maintenance worker.

- - → Sequence for qualification first as a building maintenance worker and progression to qualification as a general maintenance workers

A curriculum to provide the additional training required for general maintenance workers would be constructed by the addition of Block VI to Blocks III, IV, and V. The diagram in Figure 1 shows how organization of curricula in terms of these blocks will permit movement of workers from either of the more specialized categories to the category of general maintenance workers. Individuals could become general maintenance workers either by completing a curriculum covering Blocks V and VI after training as mechanical maintenance workers, or by completing a curriculum covering Blocks IV and VI after training as building maintenance workers.

Curricula may aim at training either workers or superintendents, but there seems to be hardly any common ground where courses might be designed to provide training that would be equally appropriate for both. The functions of workers and superintendents are so different that any training intended as preparation for advancement toward a superintendent's position would necessarily be of a kind having little direct relation to what is needed for performance of a worker's job. Training as a maintenance worker might have some advantages for a superintendent, but it does not seem to be essential as preparation for a position as a superintendent. The skills needed by workers are very largely manual ones, and attainment of proficiency in them is not a prerequisite for development of the administrative and managerial skills that must be exercised by a superintendent.

## V. CONCLUSIONS

A survey of practices in hospital maintenance departments indicates that differentiations with respect to the tasks performed by maintenance personnel can be made among occupational titles and among empirically defined categories within occupational titles. There is a clear division of labor between maintenance superintendents and maintenance workers, even in small facilities that have very few workers. Department heads and other personnel who function as superintendents, while supervising all tasks performed by workers, perform mainly tasks related to the administration and management of maintenance operations. Some superintendents, particularly those who are department heads in large urban hospitals, perform only tasks of this kind; others perform certain additional tasks, most of which are related to the planning and implementation of safety precautions and to the inspection and testing of equipment.

Differences in the numbers and kinds of tasks performed by maintenance workers furnish a basis for a classification of personnel who are neither superintendents nor craft specialists into three categories. Designations for these categories are suggested by their functional characteristics rather than by any differences in position titles among the workers. While maintenance workers within each category perform a variety of tasks cutting across the lines of different crafts and trades, two of the categories show tendencies toward specialization in certain areas. Mechanical maintenance workers are concerned substantially with maintenance of machinery and equipment and perform very little work related to carpentry. Building maintenance workers perform tasks related to the maintenance of structures and furnishings but have relatively little to do with machinery except for doing some tasks related to the operation and maintenance of boilers. A third category is constituted by general maintenance workers who do all tasks performed by either mechanical or building maintenance workers, and various additional tasks that are not performed by either of the more specialized categories.

The existing functional divisions among superintendents and workers suggest how curricula might be designed in accordance with the actual requirements of positions that are available in hospital maintenance departments. Curricula for maintenance superintendents should provide training primarily in the management-related functions that are performed by all superintendents, and should be designed to include appropriate training in certain other functions that may be either performed or supervised by superintendents. Provision also should be made for teaching the kinds of knowledge and skills necessary for exercising supervision over tasks that are performed by workers. Curricula for maintenance workers can be organized to provide training for all workers in a common core of tasks, followed by separate further training sequences for mechanical and building maintenance workers. Development of additional courses for training in functions performed only by general maintenance workers then would permit a progression from qualification as either a mechanical or a building maintenance worker to qualification as a general maintenance worker.

9/13/71
Seba Kolb, editor

APPENDIX I

PRINCIPAL SOURCES FOR ENGINEERING MAINTENANCE
TASK LIST


1. American Hospital Association, Hospital Safety Manual, Chicago: 1963.

2. American Hospital Association, Manual of Hospital Maintenance, Chicago: 1961.

3. American Hospital Association, Preventive Maintenance Guide, Chicago: 1957.

4. American Hospital Association, Transcript of the Institute for Hospital Engineers, Chicago: 1951.

5. American Society of Mechanical Engineers, Definitions of Occupational Specialties in Engineering, New York: 1951.

6. Bahme, C. W., Handbook of Disaster Control, Los Angeles: C. Bahme, 1952.

7. Clements, E. J. & C. C. Harrington, Plant Maintenance Manual, New York: Conover-Nast, 1952.

8. Evans, F. L., Maintenance Supervisor's Handbook, Houston: Gulf, 1962.

9. Everett, L., Engineering and Organization, Homewood, Ill,: Richard D. Irwin, 1959.

10. Lewis, B. T., & W. W. Pearson, Maintenance Management, New York: John F. Rider, 1963.

11. McGraw-Hill Publishing Company, Modern Plant Maintenance Practices, New York: McGraw-Hill, undated.

12. Morrow, L. C. (Ed.), Maintenance Engineering Handbook, New York: McGraw-Hill, 1966.

13. National Safety Council (Ed.), Accident Prevention Manual for Industrial Operations, Chicago: National Safety Council, 1959.

14. Oravetz, J., Audels Practical Guide to Building Maintenance, New York: Theodore Audel, 1966.

15. Owen, J. K., & R. K. Eiselben, Modern Concepts of Hospital Administration, Philadelphia: W. B. Saunders, 1962.

16. Sack, T. F., A Complete Guide to Building and Plant Maintenance, Englewood Cliffs, N.J.: Prentice Hall, 1963.

17. U.S. Navy Bureau of Yards and Docks, Inspection for Maintenance of Public Works and public utilities, NAVDOCKS TP-PW-31, Vols. 1-4, Washington, D.C.: Government Printing Office, 1959.

## APPENDIX II

## INSTRUCTIONS TO SURVEY RESPONDENTS, BACKGROUND INFORMATION SHEET, AND FIRST PAGE OF SURVEY QUESTIONNAIRE

### SURVEY DIRECTIONS

Read each task statement in the list. If you perform the task in your job, place a check mark in the first column after the statement. If you supervise performance of the task by other persons, place a check mark in the second column.

For each task that you perform (and have checked in the first column), place an X mark in one of the squares of the Frequency column and in one of the squares of the Difficulty column to indicate your answers to the following questions:

A. Frequency: How often do you perform this task?

1. Several times a day
2. Once a day or several times a week
3. Once a week or several times a month
4. Once a month or less often

B. Difficulty: How difficult is this task?

1. Easy: You follow a standard procedure that does not require any decisions; you never have to consult a procedure manual or a supervisor.

2. Moderate: You have to select the most suitable procedures to fit different conditions or situations; you sometimes have to consult a procedure manual or a supervisor.

3. Difficult: You encounter problems that may require changes in procedures or the use of new procedures; you usually have to consult a procedure manual or a supervisor.

If you perform or supervise other tasks that are not in the list, write them in any of the blank lines on the questionnaire and mark the appropriate squares for them.

BACKGROUND INFORMATION SHEET

ID number_____

Please complete this information sheet and return it with the survey form. The answers to these questions are of importance as we try to evaluate responses from a large number of people across the United States where educational and licensure requirements for specific jobs may be very different.

THIS IS A CONFIDENTIAL DOCUMENT IDENTIFIED BY NUMBER ONLY.

THIS INFORMATION WILL BE USED FOR RESEARCH PURPOSES ONLY.

1. Your position title_____

2. Department_____

3. Your major area of responsibility_____

4. Years in present position_____

5. Years in occupation_____

6. Previous occupation_____

7. Years in previous occupation_____

8. Age_____

9. Sex (circle) M F

10. Highest school grade completed (circle one)

| less than 8 | 8 | 9 | 10 | 11 | 12 | more than 12 |
|---|---|---|---|---|---|---|

(Continued on next page)

11. Highest academic level completed (circle one)

11.1 Less than high school diploma

11.2 High school diploma or equivalent

11.3 Some college (no degree)

11.4 Associate degree

11.5 Bachelor's degree (major) _____

11.6 Master's degree (major) _____

11.7 Other (specify) _____

12. Technical or other training program(s) completed (circle)

| | | Months | Area or Subject |
|---|---|---|---|
| 12.1 | None | | |
| 12.2 | On-job or apprenticeship | _____ | _____ |
| 12.3 | Military courses | _____ | _____ |
| 12.4 | Manufacturers' courses | _____ | _____ |
| 12.5 | Vocational school | _____ | _____ |
| 12.6 | Certificate or diploma program | _____ | _____ |
| 12.7 | Other courses | _____ | _____ |
| | | _____ | _____ |

13. Certificates, licenses or registrations held
(specify) _____

14. Are you employed full time in your present position? (circle) YES NO

15. Present yearly hospital salary (circle one)

14.1 less than $2000

14.2 $2000 - 3999

14.3 $4000 - 5999

14.4 $6000 - 7999

14.5 $8000 - 9999

14.6 $10000 - 11999

14.7 $12000 - 15000

14.8 more than $15000

**Step one:** Read all tasks on this page, check those tasks which you perform or supervise.

**Step two:** For those tasks checked in step one, indicate with an "X" the frequency and difficulty of performance.

Blank spaces are for other tasks that you perform or supervise.

| ENGINEERING MAINTENANCE | Check if you perform this task | Check if you supervise the performance of this task | FREQUENCY ☒ How often do you perform this task? Several times a day | Once a day or several times a week | Once a week or several times a month | Once a month or less | DIFFICULTY ☒ How difficult is this task Easy | Moderate | Difficult |
|---|---|---|---|---|---|---|---|---|---|
| 1.01 Participate in preparation of engineering and maintenance budgets. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.02 Participate in determining specifications for new equipment or materials. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.03 Participate in determining specifications for service or supply contracts. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.04 Participate in planning of maintenance procedures and schedules. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.05 Participate in planning of safety policies and procedures. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.06 Prepare procedure manuals or guides. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.07 Prepare charts, checklists, or worksheets for inspection and servicing of equipment. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.08 Prepare and maintain equipment record cards. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.09 Prepare directions for operation and maintenance of equipment by users. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.10 Consult with administration in planning to meet needs for equipment and services. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.11 Consult with other departments to determine maintenance needs. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 1.12 Consult with architects or contractors in planning of major construction or alteration work. | ☐ | ☐ | 1 | 2 | 3 | 4 | 1 | 2 | 3 |



UCLA, Div. Voc. Educ., TA
07.99 07

APPENDIX III

HEALTH CARE FACILITIES SELECTED
FOR NATIONAL SAMPLE

BIRMINGHAM

200 Beds or more

| | | |
|---|---|---|
| Baroness Erlanger Hospital | 261 Wiehl Street<br>Chattanooga, Tenn. 37403 | Harold L. Peterson<br>Administrator<br>Walter Haddock<br>Survey Liaison |
| Baptist Medical Center | 800 Montclaire Road<br>Birmingham, Alabama 35211 | Duane T. Houtz<br>Administrator<br>Survey Liaison |

100-199 Beds

| | | |
|---|---|---|
| Jeff Anderson Memorial Hospital | 2124 14th Street<br>Meridian, Miss. 39301 | Rueben S. Johnson<br>President<br>Mr. Mallette<br>Personnel Director<br>Survey Liaison |
| St. Judes Catholic Hospital | 2018 W. Fairview Avenue<br>Montgomery, Alabama 36108 | Sister M. Evangelista, RN<br>Administrator<br>Survey Liaison |

Under 100 Beds

| | | |
|---|---|---|
| Sam Howell Memorial Hospital | P.O. Box 508<br>Cartersville, Georgia 30120 | James Floyd<br>Administrator<br>Survey Liaison |
| Athens-Limestone Hospital | 105 Sanders Street<br>Athens, Alabama 35611 | Kenneth G. Hawthorne<br>Administrator<br>Mr. Huffon<br>Survey Liaison |

Extended-Care Facilities

| | | |
|---|---|---|
| Plantation Manor | P.O. Box 97<br>McCalla, Alabama 35111 | Mrs. Carmelita Lee<br>Administrator<br>Survey Liaison |
| St. Lukes Nursing Home | 1220 S. 17th Street<br>Birmingham, Alabama 35205 | Mr. Lierly<br>Administrator<br>Mr. Robbie Smith<br>Survey Liaison |

## BOSTON

### 200 Beds or more

| | | |
|---|---|---|
| Peter Bent Brigham Hospital | 721 Huntington Avenue<br>Boston, Mass. 02115 | Mrs. Karen Nierenberg<br>Personnel Director<br>Survey Liaison |
| Memorial Hospital | 119 Belmont Street<br>Worcester, Mass. 01600 | David A. Barrett<br>Administrator<br>Jeffrey Hunter<br>Project Coordinator<br>Survey Liaison |

### 100-199 Beds

| | | |
|---|---|---|
| Faulkner Hospital | 1153 Centre Street<br>Boston, Mass. 02130 | William J. Skerry<br>Director<br>James V. Kerrigan<br>Survey Liaison |
| Thayer Hospital | North Street<br>Waterville, Maine 04901 | Pearl R. Fisher, RN<br>Administrator<br>Survey Liaison |

### Under 100 Beds

| | | |
|---|---|---|
| Mary Lane Hospital | 85 South Street<br>Ware, Mass. 01082 | Owen F. Connolly<br>Administrator<br>Survey Liaison |
| Falmouth Hospital | Ter Heun Drive<br>Falmouth, Mass. 02540 | Gerald F. Flynn<br>Administrator<br>Survey Liaison |

### Extended-Care Facilities

| | | |
|---|---|---|
| Hebrew Rehabilitation Center for Aged | 1200 Centre Street<br>Boston, Mass. 02131 | Maurice I. May<br>Administrator<br>Mr. Lawrence Levinson<br>Survey Liaison |
| Cambridge Nursing Home | 1 Russell Street<br>Cambridge, Mass. 02140 | Mr. Sidney Neustadt<br>Administrator<br>Survey Liaison |

## CHICAGO

### 200 Beds or more

| | | |
|---|---|---|
| Chicago Wesley Memorial Hospital | 250 E. Superior Street<br>Chicago, Illinois 60611 | Kenneth Hartman<br>Superintendent<br>Miss Anne Blanton<br>Asst. Administrator<br>Survey Liaison |
| Kenosha Memorial Hospital | 6308 8th Avenue<br>Kenosha, Wisconsin 53140 | Riley McDavid<br>President<br>John Kolar<br>Personnel Director<br>Survey Liaison |

### 100-199 Beds

| | | |
|---|---|---|
| Delnor Hospital | 975 North 5th Street<br>St. Charles, Ill. 60174 | Mr. J. Taft<br>Administrator<br>Survey Liaison |
| Beloit Memorial Hospital | 431 Olympian Boulevard<br>Beloit, Wisconsin 53511 | Roy A. Colwell<br>Administrator<br>William Moore<br>Personnel Manager<br>Survey Liaison |

### Under 100 Beds

| | | |
|---|---|---|
| DeKalb Public Hospital | 680 Haish Boulevard<br>DeKalb, Ill. 60115 | Larry W. Pugh<br>Administrator<br>Survey Liaison |
| Bethany Brethren | 3420 W. Van Buren Street<br>Chicago, Ill. 60624 | Vernon C. Showalter<br>Executive Director<br>Milford C. Lady<br>Administrator<br>Survey Liaison |

### Extended-Care Facilities

| | | |
|---|---|---|
| Sandra Nursing Home | 14325 Blackstone<br>Dolton, Ill. 60419 | Mr. Richard Silk<br>Administrator<br>Survey Liaison |
| Fox River Rehabilitation Center | 4700 N. Clarendon Avenue<br>Chicago, Ill. 60640 | Mr. Larry Garcia<br>Administrator<br>Survey Liaison |

## DENVER

### 200 Beds or more

| | | |
|---|---|---|
| St. Marys Hospital | 7th St. and Patterson Rd.<br>Grand Junction, Colo. 81501 | Sister Michel, RN<br>Administrator<br>Mrs. Peggy Cannon<br>Personnel Director<br>Survey Liaison |
| St. Lukes Hospital | 601 East 19th Avenue<br>Denver, Colorado 80203 | Richard C. Leavitt<br>Administrator<br>Royce Davis<br>Asst. Administrator<br>Survey Liaison |

### 100-199 Beds

| | | |
|---|---|---|
| Memorial Hospital of Laramie County | Cheyenne, Wyoming 82001 | William C. Nichols<br>Administrator<br>D. Paul Vencill<br>Asst. Administrator<br>Survey Liaison |
| Poudre Valley Memorial Hospital | 1024 Lemay Avenue<br>Fort Collin, Colo. 80521 | J.R. Peterson<br>Administrator<br>Survey Liaison |

### Under 100 Beds

| | | |
|---|---|---|
| Alamosa Community Hospital | Alamosa, Colorado 81101 | Elton Reese<br>Administrator<br>Survey Liaison |
| Longmont Community Hospital | 1950 W. Mountain View<br>Longmont, Colo. 80501 | Henry Amicarello<br>Administrator<br>Survey Liaison |

### Extended-Care Facilities

| | | |
|---|---|---|
| Ivy Manor Nursing Home | 2939 Vallejo<br>Denver, Colo. 80211 | David Zapiler<br>Administrator<br>Survey Liaison |
| Eventide Nursing Home | 1800 Strow Place<br>Longmont, Colo. 80501 | Roger Fell<br>Administrator<br>Survey Liaison |

## LOS ANGELES

### 200 Beds or more

| | | |
|---|---|---|
| Kaiser Foundation Hospital | 13652 Cantara Street<br>Panorama City, Calif. 91402 | Kenneth L. Coston<br>Administrator<br>Survey Liaison |
| Santa Monica Hospital | 1250 16th Street<br>Santa Monica, Calif. 90404 | Robert A. Craig<br>Administrator<br>Norman Peterson<br>Asst. Director<br>Survey Liaison |

### 100-199 Beds

| | | |
|---|---|---|
| Morningside Hospital | 8711 S. Harvard Boulevard<br>Los Angeles, Calif. 90047 | T.W. Olson<br>Administrator<br>Survey Liaison |
| West Valley Community Hospital | 5333 Balboa<br>Encino, Calif. 91316 | Carl Gottschalk<br>Administrator<br>Survey Liaison |

### Under 100 Beds

| | | |
|---|---|---|
| Community Hospital of Gardena | 1246 W. 155th St., Box 2106<br>Gardena, Calif. 90247 | Max M. Weinberg<br>Administrator<br>Mrs. Smith<br>Director of Nursing<br>Survey Liaison |
| Garden Park Genral Hospital | 9922 Gilbert Street<br>Anaheim, Calif. 92804 | Edwin Bixby<br>Administrator<br>Survey Liaison |

### Extended-Care Facilities

| | | |
|---|---|---|
| Kaiser Extended Care | 8015 Woodman<br>Panorama City, Calif. 91402 | Kenneth L. Coston<br>Administrator<br>Survey Liaison |
| Beverly West Convalescent Hospital | 1516 Sawtelle Boulevard<br>Los Angeles, Calif. 90025 | M. Bert Hattenbach<br>Administrator<br>Survey Liaison |

## SEATTLE

### 200 Beds or more

| | | |
|---|---|---|
| St. Francis Xavier Cabrini Hospital | 920 Terry Avenue<br>Seattle, Wash. 98104 | Mother Lawrence<br>Administrator<br>Mary Miller, R.A.<br>Survey Liaison |
| Emanuel Hospital | 2801 N. Gantenbein Avenue<br>Portland, Oregon 97227 | Personnel Director<br>Survey Liaison |

### 100-199 Beds

| | | |
|---|---|---|
| St. Josephs Hospital | 1006 North H Street<br>Aberdeen, Wash. 98520 | Sister Jerome Mary<br>Administrator<br>Survey Liaison |
| Vancouver Memorial Hospital | 3400 Main Street<br>Vancouver, Wash. 98663 | Paul S. Griff<br>Administrator<br>Mrs. Leeson<br>Survey Liaison |

### Under 100 Beds

| | | |
|---|---|---|
| Tri-State Memorial Hospital | 1221 Highland Drive<br>Clarkston, Wash. 99403 | William J. Yeats<br>Administrator<br>Survey Liaison |
| West Seattle General Hospital | 2601 SW Webster Street<br>Seattle, Wash. 98126 | Bruce M. Burton<br>Administrator<br>Eleanor H. Rhees<br>Survey Liaison |

### Extended-Care Facilities

| | | |
|---|---|---|
| Mt. Baker Convalescent Home | 1700 24th Street S<br>Seattle, Wash. 98144 | Mrs. Spore<br>Administrator<br>Survey Liaison |
| Greenwood Convalescent Home | 202 North 110th Street<br>Seattle, Wash. 98133 | Arthur L. Marsh<br>Survey Liaison |

APPENDIX IV

LISTINGS OF TASKS PERFORMED BY OCCUPATIONAL CATEGORIES

Block I. Tasks Performed by Both Groups of Superintendents

1. Participate in preparation of engineering and maintenance budgets.
2. Participate in determining specifications for new equipment or materials.
3. Participate in determining specifications for service or supply contracts.
4. Participate in planning of maintenance procedures and schedules.
5. Participate in planning of safety policies and procedures.
6. Prepare procedure manuals or guides.
7. Prepare charts, checklists, or worksheets for inspection and servicing of equipment.
8. Prepare and maintain equipment record cards.
9. Prepare directions for operation and maintenance of equipment by users.
10. Consult with administration in planning to meet needs for equipment and services.
11. Consult with other departments to determine maintenance needs.
12. Consult with architects or contractors in planning of major construction or alteration work.
13. Consult with other hospital engineering and maintenance departments.
14. Consult with other outside engineering agencies.
15. Consult with utility services.
16. Consult with insurance agencies, fire departments, or other outside agencies.
17. Interview salesmen.
18. Give information or assistance to inspectors from government, insurance, or other agencies.
19. Confer with inspectors from outside agencies to evaluate results of inspections.

20. Consult with other institutions or outside agencies to coordinate emergency and disaster plans.

21. Develop work-simplification and cost-reduction methods.

22. Develop work performance standards.

23. Evaluate performance of maintenance workers.

24. Interview and evaluate job applicants.

25. Develop and administer in-service training programs.

26. Instruct maintenance workers in new procedures and techniques.

27. Give instructions or demonstrations to users in operation and maintenance of equipment.

28. Schedule boiler shifts and operations.

29. Supervise power plant operations.

30. Keep records on inspection, servicing, and repair of structures, systems, equipment, etc.

31. Review records to check that prescribed inspection and maintenance schedules are being followed.

32. Keep records on fuel, water, and power consumption.

33. Review cost records to determine efficiency of operations.

37. Maintain files of blueprints, diagrams, specifications, etc.

38. Inspect work performed by outside contractors; verify that contract specifications have been met.

39. Receive and review inspection reports; initiate actions to correct reported defects.

40. Evaluate work requests; consider necessity for work and availablity of money and labor.

41. Analyze work requests; break down work into units by operations and/or crafts.

42. Estimate material and labor costs for jobs.

43. Consult with supervisors and foremen to plan and coordinate work schedules.

44. Consult with craftsmen in planning of procedures and selection of materials for jobs.

45. Assign priorities to jobs.

46. Prepare work orders for jobs.

47. Prepare work plans stating details of work to be performed and specifications for materials or equipment.

48. Prepare requisitions for materials, parts, etc.

49. Prepare diagrams, plans, or drawings of structures, systems, or equipment.

50. Review and approve work orders and work plans.

51. Review and approve requisitions for non-stock items.

52. Assign workers to jobs.

53. Arrange for availability of job sites, and notify appropriate persons of shutdowns of equipment or facilities.

54. Select outside contractors for jobs not performed by maintenance staff.

55. Visit job sites and inspect work in progress.

56. Supervise emergency repair work.

57. Supervise major construction, alteration, or repair work.

58. Inspect completed work.

61. Read and interpret blueprints, diagrams, specifications, etc.

62. Carry out scheduled periodic inspections of structures, systems, or equipment.

63. Carry out scheduled periodic overhauls or replacements of parts of equipment or systems.

67. Investigate and determine causes of material or equipment failures.

68. Survey worn or damaged equipment to determine if it should be repaired or replaced.

70. Receive requests from other departments for maintenance or repair work.

365. Participate in planning of emergency and disaster procedures.

384. Arrange for unsafe tools or equipment to be withdrawn from service.

Block II. Tasks Performed by First Group of Superintendents but not by Second Group

34. Prepare departmental activity and cost reports.

35. Take equipment inventories.

36. Take inventories of engineering and maintenance stores.

37. Maintain files of blueprints, diagrams, specifications, etc.

64. Inspect equipment or materials delivered by suppliers; check for damage or defects, and verify that specifications have been met.

65. Test operation of new equipment before placing in service.

66. Inspect and check condition of stored materials or equipment.

69. Salvage usable parts from discarded equipment.

79. Regulate operations of electrical generating equipment.

81. Regulate operations of heating, air conditioning, and other systems.

85. Check operating condition of equipment by observation of water columns, pressure gages, meters, etc.

87. Observe fuel gages, flow meters, etc., and record data on fuel, water, and power consumption.

103. Inspect boilers and furnaces for leaks, cracks, corrosion, ash accumulation, etc.

124. Determine proper types and sizes of pipes and fittings for plumbing or steam fitting installations.

139. Inspect pipes and fittings for leaks, cracks, corrosion, etc.

141. Check pressures in piping systems with pressure gages.

150. Locate and correct noise or vibration conditions in steam lines.

161. Inspect pumps; check pump pressures, packing, alignments, etc.

164. Inspect autoclaves and other pressure vessels; check vents, valves, traps, etc.

165. Test pressure vessel safety valves.

169. Inspect other steam-using equipment in laundries, kitchens, etc.; check valves, traps, exhaust lines, etc.

189. Locate defects such as short circuits and bad connections.

197. Inspect building wiring systems; check for worn insulation, loose wires, bad connections, etc.

198. Inspect power control and distribution panels; check switches, relays, fuses, etc.

200. Test operation of emergency generators and lighting.

207. Inspect motors and generators; check temperatures, electrical connections, condition of parts, etc.

231. Inspect refrigerating and air-conditioning equipment; check gage readings, electrical connections, alignments of parts, etc.

232. Test pressure relief and safety valves.

233. Check operation and accuracy of thermostats and other controls or regulators.

268. Inspect floors, walls, roofs, and other surfaces for cracks, damage, or deterioration.

269. Inspect building foundations and trusses for sagging, deformation, etc.

335. Select the appropriate types of paints for different surfaces and conditions.

363. Keep records on nature and location of hazard sources and safety equipment.

364. Prepare safety regulations governing the use of equipment.

365. Participate in planning of emergency and disaster procedures.

366. Participate in organizing and evaluating emergency and disaster drills or exercises.

367. Keep records on services, equipment, and supplies available for use in emergencies or disasters.

368. Instruct others in the use of safety and fire protection equipment.

369. Post and maintain signs and instructions for the use of safety and fire protection equipment.

370. Post and maintain warning signs to indicate special hazards such as high voltages, radiation, etc.

372. Carry out periodic safety inspections.

373. Check machinery guards and other protective devices or equipment.

375. Check safety of storage of flammable or other hazardous materials.

376. Check operating rooms and other critical areas for hazards.

377. Check condition of tools, ladders, and materials handling equipment.

378. Inspect fire-fighting equipment; check condition of extinguishers, hydrants, pumps, hoses.

380. Inspect fire and emergency exits; check operation of locks and latches.

381. Check operation of automatic fire-detection systems and automatic sprinklers.

382. Participate in fire drills as a member of the fire brigade.

383. Direct attention of workers or supervisors to unsafe conditions or practices.

384. Arrange for unsafe tools or equipment to be withdrawn from service.

385. Prepare reports on unsafe conditions or practices.

386. Investigate and prepare reports on accidents or injuries.

Block III. Tasks Performed by all Groups of Workers

11. Consult with other departments to determine maintenance needs.

62. Carry out scheduled periodic inspections of structures, systems, or equipment.

63. Carry out scheduled periodic overhauls or replacements of parts of equipment or systems.

67. Investigate and determine material or equipment failures.

68. Survey worn or damaged equipment to determine if it should be repaired or replaced.

69. Salvage usable parts from discarded equipment.

70. Receive requests from other departments for maintenance or repair work.

72. Transport materials or equipment to and from job sites, workshops, storerooms, etc.

77. Stand watches in power plant or boiler room.

81. Regulate operations of heating, air-conditioning, and other systems.

85. Check operating condition of equipment by observation of water columns, pressure gages, meters, etc.

86. Record temperatures, pressures, and other operational data.

91. Prepare boilers for service.

107. Clean valves, strainers, nozzles, and other boiler accessories.

108. Clean and lubricate pumps and other auxiliary equipment.

113. Replace valves, gages, or meters.

115. Repair pumps and other auxiliary equipment.

126. Thread metal pipes.

131. Sharpen or repair tools or instruments.

132. Install pipes, valves, traps, vacuum breakers, and other fittings.

133. Install plumbing fixtures such as sinks, toilets, sprinklers.

139. Inspect pipes and fittings for leaks, cracks, corrosion, etc.

140. Check operation of valves, traps, and other fittings.

145. Clean and lubricate valves, traps, and other fittings.

146. Repair leaks in piping and connections.

147. Replace defective pipes.

149. Repair or replace insulation on pipes and fixtures.

153. Clear stoppages in drain lines.

154. Repair or replace defective parts of plumbing fixtures.

155. Repair tank-flushing assemblies.

157. Repair leaks in valves, traps, or other fittings.

158. Replace washers or diaphragms.

159. Replace other parts of valves, traps, or other fittings.

161. Inspect pumps; check pump pressures, packing, alignments, etc.

162. Clean and lubricate pumps.

163. Adjust or repair pumps; replace packing, bearings, rings, or other parts.

168. Inspect radiators, convectors, heating coils; check valves, connections, etc.

169. Inspect other steam-using equipment in laundries, kitchens, etc.; check valves, traps, exhaust lines, etc.

179. Install convenience outlets and surface extension wiring.

189. Locate defects such as short circuits and bad connections.

200. Test operation of emergency generators and lighting.

201. Test and charge batteries.

202. Repair defects in building wiring and outlets; renew contacts, replace broken wires, worn insulation, etc.

203. Repair or replace defective switches, relays, circuit breakers, etc.

204. Repair or replace lamps, ceiling panels, or other lighting fixtures.

206. Repair electrical appliances such as vacuum cleaners, food mixers, electric irons, etc.

207. Inspect motors and generators; check temperatures, electrical connections, condition of parts, etc.

210. Inspect and check operation of machinery in kitchens, laundries, shops, etc.

211. Clean and lubricate motors and generators.

212. Clean and lubricate other machinery.

226. Adjust or repair other machinery in kitchens, laundries, shops, etc.

227. Adjust or repair portable power tools.

235. Clean and lubricate motors, compressors, condensers, and other refrigerating, and air-conditioning equipment.

236. Clean air washing or filtering equipment.

237. Clean air ducts, ventilators, fans, hoods, etc.

245. Replace air filters.

248. Adjust or repair grilles, dampers, louvers, etc.

274. Cut holes and passages for pipes and conduits.

278. Construct and install metal racks, railings, shelves, etc.

300. Adjust or repair metal furniture; adjust swivel mechanisms, replace castors, etc.

330. Remove snow and ice from buildings and grounds.

373. Check machinery guards and other protective devices or equipment.

374. Adjust or replace protective devices and equipment.

382. Participate in fire drills as a member of the fire brigade.

383. Direct attention of workers or supervisors to unsafe conditions or practices.

## Block IV. Tasks Performed by General and Mechanical but not by Building Maintenance Workers

8. Prepare and maintain equipment record cards.

43. Consult with supervisors and foremen to plan and coordinate work schedules.

61. Read and interpret blueprints, diagrams, specifications, etc.

76. Report hours worked and quantities of materials used on jobs.

82. Regulate water and steam distribution.

90. Install air heaters, pumps, or other auxiliary equipment.

91. Prepare boilers for service.

114. Repair or replace other boiler accessories.

124. Determine proper types and sizes of pipes and fittings for plumbing or steam-fitting installations.

125. Cut and assemble pipes.

130. Weld metal joints.

134. Install convectors, heating coils, or other steam-using equipment.

136. Install pressure change assemblies and reducing valves.

138. Install pumps.

141. Check pressures in piping systems with pressure gages.

143. Adjust settings of pressure-reducing and relief-valve installations.

144. Clean pipes; remove dirt, grease, scale.

150. Locate and correct noise or vibration conditions in water and steam lines.

151. Adjust or repair joint anchorages, hangers, brackets, etc.

156. Repair or replace sprinkler heads.

164. Inspect autoclaves and other pressure vessels; check vents, valves, traps, etc.

165. Test pressure vessel safety valves.

167. Adjust or repair pressure vessels; replace worn or defective parts.

170. Clean steam using equipment.

171. Adjust or repair steam-using equipment; replace worn or defective parts.

172. Inspect gas appliances; check burners, valves, vents, etc.

173. Locate and repair leaks in gas appliances and connections.

174. Adjust or repair gas appliances; replace parts of burner assemblies, pressure regulators, etc.

178. Install conduits and wiring for power, lighting, or communication systems.

180. Install fixtures for lighting and communications systems.

182. Install wiring and power connections for motors and machinery.

183. Install grounds on machinery and equipment.

185. Install motors and drive assemblies.

187. Install machinery or equipment in kitchens, laundries, laboratories, etc.

188. Measure currents, voltages, resistances, etc., in electrical circuits and equipment.

190. Test circuits for continuity and current leakages.

191. Test circuits and equipment for overloads and underloads.

192. Check line voltages on lamps or other fixtures.

193. Test ground and insulation resistances.

195. Test fuses and circuit breakers.

197. Inspect building wiring systems; check for worn insulation, loose wires, bad connections, etc.

198. Inspect power control and distribution panels; check switches, relays, fuses, etc.

199. Inspect and check operation of lighting and communications fixtures.

213. Adjust or repair motors and generators; adjust alignments of parts, replace worn or defective parts.

214. Repair defects in wiring and power connections; renew wiring, adjust contacts, replace defective switches, etc.

215. Adjust or repair housings, mountings, or supports of motors or other machinery.

217. Adjust tensions or settings of brushes, commutators, belts, etc.

218. Replace brushes, commutators, armatures, or other electrical parts.

219. Replace bearings, rings, shaft sleeves, or other mechanical parts.

222. Adjust or repair pneumatic tube systems.

223. Adjust or repair operating room equipment such as suction machines and spark gap machines.

225. Adjust or repair other clinical and laboratory equipment such as respirators, incubators, centrifuges, etc.

228. Install refrigerating and air-conditioning equipment.

230. Install thermostats, humidistats, or other regulating devices.

231. Inspect refrigerating and air-conditioning equipment; check gage readings, electrical connections, alignments of parts, etc.

232. Test pressure relief and safety valves.

233. Check operation and accuracy of thermostats and other controls or regulators.

234. Test refrigeration systems for leaks.

239. Adjust refrigerating system controls to regulate compression and refrigerant flow.

243. Adjust valves and dampers to balance air-conditioning or ventilating systems.

244. Test air filter efficiencies.

246. Adjust or repair air washers, dust collectors, or other filtering equipment.

250. Renew wiring and electrical connections; replace defective switches, relays, or other components.

252. Replace gaskets, bearings, piston rings, or other parts.

253. Replace defective valves and connections.

255. Repair leaks in compressed air lines.

## Block V. Tasks Performed by General and Building Maintenance Workers but not by Mechanical Maintenance Workers

75. Clean up job sites; dispose of waste materials.

78. Regulate operations of steam-generating equipment.

87. Observe fuel gages, flow meters, etc., and record data on fuel, water, and power consumption.

92. Start boilers; raise temperatures and pressures to operating levels.

98. Test gage cocks and water level controls.

100. Blow down water columns and gage glasses.

101. Blow down boilers.

102. Lubricate valves and other boiler accessories.

103. Inspect boilers and furnaces for leaks, cracks, corrosion, ash accumulation, etc.

104. Clean boiler tubes.

105. Clean boilers.

106. Clean water glasses.

109. Clean boiler furnaces.

112. Replace water glasses.

122. Analyze boiler feed water.

123. Treat boiler feed water.

270. Arrange properly ventilated storage of lumber and other materials.

273. Demolish or remove walls or other structural members.

279. Construct and install partitions.

280. Construct drawers, benches, cupboards, and other furnishings.

281. Cut and set glass for doors, windows, cabinets, etc.

283. Install doors and windows.

284. Install trim and moldings.

287. Repair doors; trim edges, shim hinges, reset screws, etc.

288. Repair windows; eliminate sticking, replace sash cords, etc.

289. Replace loose or broken panes of glass.

290. Putty windows, caulk frames and joints.

291. Install weather stripping.

292. Cut and install metal or plastic screening.

293. Adjust or repair window shades; adjust roller tensions, bracket mountings, etc.

294. Adjust or repair venetian blinds; replace cords, tapes, slats, etc.

296. Adjust or repair locks and latches.

298. Resurface tables, desks, counters, etc.

299. Adjust or repair wooden furniture; replace chair rungs, adjust sticking drawers, etc.

303. Lay linoleum, vinyl, rubber, or other floor and wall coverings.

305. Install laminate surfacings.

308. Install non-slip, non-skid materials on floors, stairs, or other surfaces.

311. Repair dents, cracks, abrasions, etc., in floor and wall coverings.

316. Replace worn or damaged bricks, blocks, tiles, etc.

320. Patch and repair concrete surfaces.

324. Repair leaks in roofs.

328. Clean gutters and downspouts.

331. Operate incinerators.

333. Maintain grounds; grade and fill, trim trees, plant shrubbery, etc.

334. Arrange safe storage of paints, oils, solvents, etc.

344. Clean and prepare wooden or other surfaces for painting or plastering.

345. Remove old paint or finishes.

346. Patch or fill holes and cracks in surfaces before painting or plastering.

347. Paint metal surfaces.

348. Paint concrete or masonry surfaces.

349. Paint wooden, plaster, or other surfaces.

350. Apply shellac, varnish, or other finishes.

359. Patch and repair plaster or stucco surfaces.

377. Check condition of tools, ladders, and materials-handling equipment.

378. Inspect fire fighting equipment; check condition of extinguishers, hydrants, pumps, hoses.

380. Inspect fire and emergency exits; check operation of locks and latches.

384. Arrange for unsafe tools or equipment to be withdrawn from service.

Block VI. Tasks Performed by General Maintenance Workers Only

2. Participate in determining specifications for new equipment or materials.

4. Participate in planning of maintenance procedures and schedules.

5. Participate in planning of safety policies and procedures.

7. Prepare charts, checklists, or worksheets for inspection and servicing of equipment.

18. Give information or assistance to inspectors from government, insurance, or other agencies.

26. Instruct maintenance workers in new procedures and techniques.

35. Take equipment inventories.

36. Take inventories of engineering and maintenance stores.

44. Consult with craftsmen in planning of procedures and selection of materials for jobs.

52. Assign workers to jobs.

53. Arrange for availability of job sites, and notify appropriate persons of shutdowns of equipment or facilities.

64. Inspect equipment or materials delivered by suppliers; check for damage or defects, and verify that specifications have been met.

65. Test operation of new equipment before placing in service.

66. Inspect and check condition of stored materials or equipment.

73. Operate forklifts, hoisting gear, or other materials-handling equipment.

74. Erect scaffolding or staging.

79. Regulate operations of electrical generating equipment.

80. Regulate operations of compressors.

89. Install boiler accessories and connections.

93. Adjust rate of firing of boilers to meet demands and maintain efficient operation.

94. Adjust boiler feed water controls.

95. Adjust fuel combustion controls.

96. Regulate operations of automatic stokers, pumps, and other auxiliary equipment.

99. Check operation of burner assemblies, steam nozzles, and other boiler accessories.

116. Repair or replace boiler insulation.

118. Repair or replace combustion chamber linings.

119. Repair or replace dampers, grates, or other parts of furnaces.

120. Measure gas, air, or steam temperatures.

127. Cut patterns for sheet metal work.

128. Fabricate sheet metal items.

129. Fabricate or rebuild metal parts for machinery, equipment, furniture, etc.

135. Install chlorinators, water softeners, or other water treatment equipment.

137. Install gas appliances.

142. Test steam traps with test valves.

148. Repair leaks or corrosion spots in tanks and pressure vessels.

152. Thaw frozen pipes.

160. Repair chips and cracks in china or porcelain fixtures.

166. Drain and clean pressure vessels.

175. Inspect and service chlorinators or other water treatment equipment.

176. Determine proper types and sizes of wires and conduits for electrical installations.

177. Cut and shape conduits for building wiring.

181. Install control panels, switches, meters, fuses, etc.

184. Seal electrical installations in hazardous areas.

205. Repair or replace microphones, speakers, or other communications fixtures.

209. Inspect and check operation of operating room and laboratory machinery and equipment.

220. Refinish or rebuild bearing seats, shaft sleeves, or other parts of motors or machinery.

238. Clean compressed air lines.

240. Drain moisture traps or compartments.

247. Repair duct work; caulk joints, replace worn insulation, etc.

249. Repair refrigerating and air-conditioning equipment.

254. Repair leaks in refrigerating system.

256. Inspect elevators; check cages, shaftways, hoisting machinery.

257. Inspect and test elevator control and signal systems.

260. Adjust alignments or movements of doors, sheaves, rails, or other parts.

275. Construct boxes or crates for shipping or storage.

276. Construct braces, supports, scaffolds, etc.

277. Construct and install wooden racks, railings, shelves, etc.

304. Install fiberboard, plasterboard, or other siding materials.

306. Install thermal insulating materials.

309. Replace worn or damaged floorboards, stair treads, moldings, etc.

310. Refinish floors or other surfaces.

312. Tighten loose floorboards or stair treads.

315. Lay bricks, blocks, tiles, etc. for construction of new surfaces or structures.

318. Prepare concrete mixtures.

319. Pour or lay concrete for new surfaces or structures.

321. Clean and remove stains from concrete or masonry surfaces.

323. Repair or recoat asphalt or blacktop surfaces.

325. Repair or recoat roll or built-up roofing.

327. Repair or renew roof flashings.

329. Repair or replace gutters and downspouts.

335. Select the appropriate types of paints for different surfaces and conditions.

337. Mix paints to match specified colors.

338. Prepare finishes, stains, and bleaches.

339. Prepare solvents and cleaning solutions.

340. Cut stencils for painting signs.

341. Wash walls, woodwork, or other building surfaces.

342. Clean and prepare metal surfaces for painting.

343. Clean and prepare concrete or masonry surfaces for painting or plastering.

351. Bleach or stain wooden surfaces.

352. Apply sealing compounds to floors or other surfaces.

353. Apply water-repellant, insect-repellant, or other preservative solutions.

354. Prepare plaster or stucco mixtures.

361. Paint signs.

368. Instruct others in the use of safety and fire protection equipment.

369. Post and maintain signs and instructions for the use of safety and fire protection equipment.

370. Post and maintain warning signs to indicate special hazards such as high voltages, radiation, etc.

371. Post temporary warnings or out-of-order signs where work is in progress or facilities are out of service.

372. Carry out periodic safety inspections.

375. Check safety of storage of flammable or other hazardous materials.

376. Check operating rooms and other critical areas for hazards.

379. Refill fire extinguishers; renew or replace other items.

381. Check operation of automatic fire detection systems and automatic sprinklers.

Tasks Supervised by 25 Percent or More of Superintendents
but not Performed by Either Superintendents or Workers

59. Receive and file reports of time and materials expended on jobs.

83. Regulate electric power distribution.

84. Regulate fuel and gas distribution.

88. Install boilers and furnaces.

110. Repair leaks or cracks in boiler plates, casings, settings, etc.

111. Replace defective tubes.

117. Repair leaks in furnaces.

121. Analyze flue gases.

194. Test conductivities of floors or other surfaces.

196. Test vacuum tubes and other electronic components.

208. Inspect transformers; check temperatures, liquid levels, etc.

224. Adjust or repair electronic equipment such as diathermy machines and x-ray machines.

241. Add or withdraw refrigerant.

242. Pump down and recharge refrigerating systems.

251. Adjust settings or alignments of parts.

297. Make keys.

301. Repair or renew upholstery.

307. Install sound and vibration insulating materials.

317. Repair loose mortar joints.

322. Treat concrete surfaces for dusting, chalkiness, efflorescence, etc.

336. Prepare paints by mixing pigments and vehicles.

355. Install lath and furring.

356. Apply plaster or stucco over concrete or masonry surfaces.

357. Apply plaster or stucco over wooden or other surfaces.

358. Finish plaster or stucco surfaces by smoothing, grinding, polishing.

362. Do freehand lettering or other fine brushwork.